HAWKER HURRICANE MK I–V

MARTYN CHORLTON

© Osprey Publishing • www.ospreypublishing.com

AIR VANGUARD 6

HAWKER HURRICANE MK I–V

MARTYN CHORLTON

© Osprey Publishing • www.ospreypublishing.com

First published in Great Britain in 2013 by Osprey Publishing,
Midland House, West Way, Botley, Oxford, OX2 0PH, UK
43–01 21st St, Suite 220B, Long Island City, NY 11101, USA
E-mail: info@ospreypublishing.com

Osprey Publishing is part of the Osprey Group

© 2012 Osprey Publishing Ltd.

All rights reserved. Apart from any fair dealing for the purpose of private study, research, criticism or review, as permitted under the Copyright, Designs and Patents Act, 1988, no part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, electrical, chemical, mechanical, optical, photocopying, recording or otherwise, without the prior written permission of the copyright owner. Enquiries should be addressed to the Publishers.

A CIP catalogue record for this book is available from the British Library

Print ISBN: 978 1 78096 602 1
PDF e-book ISBN: 978 1 78096 603 8
EPUB e-book ISBN: 978 1 78096 604 5

Index by Sharon Redmayne
Typeset in Deca Sans and Sabon
Originated by PDQ Digital Media Solutions Ltd., Suffolk, UK
Printed in China through Bookbuilders

13 14 15 16 17 10 9 8 7 6 5 4 3 2 1

www.ospreypublishing.com

Osprey Publishing is supporting the Woodland Trust, the UK's leading woodland conservation charity, by funding the dedication of trees.

© Osprey Publishing. Access to this book is not digitally restricted. In return, we ask you that you use it for personal, non-commercial purposes only. Please don't upload this ebook to a peer-to-peer site, email it to everyone you know, or resell it. Osprey Publishing reserves all rights to its digital content and no part of these products may be copied, stored in a retrieval system or transmitted in any form by any means, electronic, mechanical, recording or otherwise (except as permitted here), without the written permission of the publisher. Please support our continuing book publishing programme by using this e-book responsibly.

Every effort has been made by the Publisher to secure permissions to use the images in this publication. If there has been any oversight we would be happy to rectify the situation and written submission should be made to Osprey Publishing.

CONTENTS

INTRODUCTION 4

DESIGN AND DEVELOPMENT 18
- First of the Many: A Fighter with Pedigree
- Breaching the 200mph barrier
- F.36/34 Single-Seat Fighter – High Speed Monoplane
- Enter the Rolls-Royce PV.12
- First Flight
- A Troublesome Child
- Refining the Merlin

TECHNICAL SPECIFICATIONS 16
- The Anatomy of a Legend: Overview of the Hurricane
- The Fuselage
- The Wings
- The Undercarriage
- Powerplant – The Song of a Merlin

MARK BY MARK 18
- Hurricane Mk I
- Hurricane Mk II, IIa, IIb, IIc and IId
- Hurricane Mk III
- Hurricane Mk IV
- Hurricane Mk V
- Photographic Reconnaissance
- Made in Canada
- The Two-seaters
- The Proposals

OPERATIONAL HISTORY 34
- 111 Squadron Leads the Way
- Record-Breaking Flight
- More Squadrons Follow
- The 'Phoney War'
- The Winter War
- Norway
- The Battle of France
- Dunkirk
- Malta – The Beginning
- The Battle of Britain
- On the Back Foot in North Africa and the Mediterranean
- Taking the Fight across the Channel
- Defence of Malta
- Air Defence in Russia
- Growing Strength in North Africa, the Mediterranean and the Middle East
- Singapore, Ceylon and Burma

CONCLUSION 62

FURTHER READING 63

INDEX 64

© Osprey Publishing • www.ospreypublishing.com

HAWKER HURRICANE MK I–V

INTRODUCTION

It may not have been the prettiest or the best performing plane, but the Hawker Hurricane will always be seen as the aircraft necessary at the time, and thankfully it was produced in high numbers. Its design had incorporated older, tried and tested technologies but also took fighter design a little further forward.

When George Bulman first took the prototype into the air at Brooklands on 6 November 1935, the new Hurricane was presented to the world as a modern fighting monoplane. Fitted with eight guns, a retractable undercarriage and the ability to breach 300mph with ease, many journalists of the day commented that the peak of fighter performance had finally been reached.

Despite the promise shown by the new fighter, the Air Ministry remained lethargic, even with the dark clouds of another world conflict approaching. It was thanks to the Hawker Aircraft Company beginning production without a solid contract that the RAF received the aircraft as early as it did.

Six Hurricanes of 111 Squadron pose for the camera with L1552 in the foreground, which only served with the unit briefly before moving on to 56 Operational Training Unit at Sutton Bridge. Beyond is L1555, which was nicknamed the 'State Express' after Sqn Ldr Gillan made his record-breaking flight in the Hurricane. (*Aeroplane* via author)

With 111 Squadron leading the way, only a handful of squadrons were operational with the Hurricane on the outbreak of World War II. Thanks to sudden massive orders and a well-organised manufacturer who subcontracted production to Gloster Aircraft Company and General Aircraft, more squadrons were rapidly re-equipped, cutting their teeth during the battle of France. It was during the Battle of Britain that the type excelled and it undoubtedly formed the backbone of Fighter Command at the time.

With technology advancing at high speed, the Hurricane was steadily overtaken by the Supermarine Spitfire in the fighter defence role. However, it still remained the fighter of choice in North Africa and the Far East, where it often fought against overwhelming Japanese odds. Despite a large number being shot down in these far-flung conflicts, many were returned to the air after hasty repairs while more fragile designs would have been grounded permanently. A real workhorse in all respects, the Hurricane was adapted for the ground

© Osprey Publishing • www.ospreypublishing.com

attack role with a modified wing that could carry bombs, high calibre cannon, or drop tanks. The airframe's ability to take a great deal of punishment while flying these low-level operations meant that more pilots returned to base with heavy battle damage rather than having to face bailing out over occupied territory. While many were relegated to a host of second line units during the later stages of World War II, the Hurricane fought on in the Far East, especially Burma, where the fighter wreaked havoc amongst the Japanese forces.

George Bulman, the Hawker Aircraft Company's chief test pilot from 1925 to 1945, with Sir Thomas Octave Murdoch Sopwith at Brooklands in the early 1930s. Bulman flew a host of aircraft that were designed by the Sydney Camm team including the Heron, Horsley, Hart, Tomtit, F.20/27, Demon 1933 and Hector. (*Aeroplane* via author)

DESIGN AND DEVELOPMENT

First of the Many: A Fighter with Pedigree

The Sopwith Aviation Company had made a great contribution during World War I with regard to fighter aircraft. Its excellent designs included the Tabloid, 1½ Strutter, Pup, Triplane and of course the iconic Camel. Tommy Sopwith was quite a visionary when it came to fighter design, and even the monoplane version of the Camel, the Swallow, was attempted, but its performance did not warrant any further development.

A huge surplus of military aircraft following the Armistice put paid to any further serious role in aviation for Sopwith Aviation. An attempt to broaden the company's horizons by purchasing ABC Motorcycles and ABC Motors was a failed venture and Sopwith was liquidated in 1920. Undeterred, Tommy Sopwith, along with Harry Hawker, Fred Sigrist and Bill Eyre, immediately formed H. G. Hawker Engineering.

Being based at the traditional home of British aviation, Brooklands, would prove to be particularly advantageous, thanks to it being the home of Vickers Ltd, another aviation manufacturer. Hawker's first aircraft, the Duiker, was designed by the fledgling company's first chief designer, Capt Thomson, who would rely heavily on equipment and parts loaned and manufactured by Vickers to complete the project. Designed to meet a Corps Reconnaissance requirement to support the British Army, the Duiker made its first flight in July 1923. No orders were forthcoming, but it did teach Hawker a great deal and the next design would progress considerably further than a single prototype.

While the Duiker may have been Hawker's first design, it was not the company's first aircraft to fly. In 1922, the company responded to Specification 25/22, which called for a night fighter. Once again designed by Capt Thomson, the first Woodcock, J6987, was flown in March 1923 by F. P. Raynham. The prototype was rejected, along with Capt Thomson, who was replaced by W. G. Carter. Carter redesigned the aircraft into the successful Woodcock II, of which the RAF eventually ordered 62. The design also gave the company its first overseas sales, as three examples of a version called the Danecock were sold to the Danish Air Force. A construction licence was later applied for as well and the Danes built a dozen aircraft under the name Dankok. Hawker was on its way.

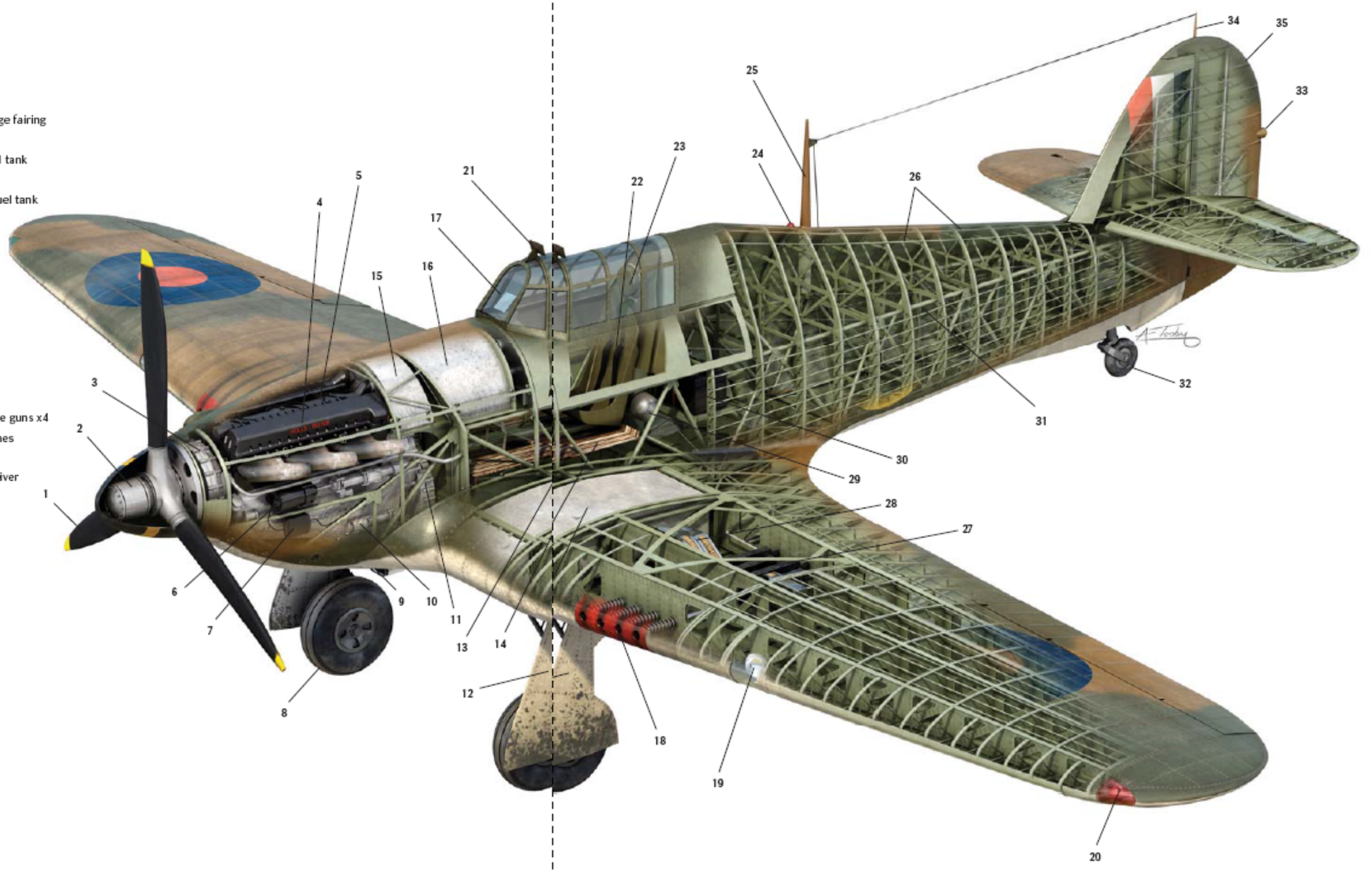
Throughout the 1920s and into the early 1930s, Hawker achieved varying success not only with fighter designs but also with torpedo and light bombers,

© Osprey Publishing • www.ospreypublishing.com

A HURRICANE MK IC

Key

1. Rotol three-bladed propeller
2. Propeller pitch change mechanism
3. Propeller reduction gearbox
4. Rolls-Royce Merlin III V12 liquid-cooled engine
5. Coolant pipes
6. Generator (engine driven)
7. Ignition control unit
8. Starboard main wheel
9. Carburettor intake
10. Inertia starter
11. Single stage supercharger
12. Port main wheel undercarriage fairing
13. Footboards
14. Port 34½ Imperial Gallon fuel tank
15. Coolant header tank
16. Reserve 28 Imperial Gallon fuel tank
17. Bullet-proof windscreen
18. Machine-gun muzzles
19. Port landing light
20. Port navigation light
21. Rear view mirror
22. Pilot's seat
23. Armoured head rest
24. Identification light
25. Aerial mast
26. Wooden dorsal formers
27. Port .303in Browning machine guns x4
28. Inboard ammunition magazines
29. Oxygen cylinder
30. TR 9D radio transmitter/receiver
31. Upper longeron
32. Fixed, castoring tail wheel
33. Navigation light
34. Rear aerial mast
35. Fabric-covered rudder



© Osprey Publishing • www.ospreypublishing.com

© Osprey Publishing • www.ospreypublishing.com

The beautiful and rapid High Speed Fury, which as the Fury Mk II gave the RAF the high-performance fighter it had been looking for. K3586 served with Rolls-Royce, the RAE and briefly with 43 Squadron for service trials. (Via author)

especially the Hart, which became a mainstay type for the RAF from 1930 and into World War II. From 1925, Hawker's chief designer was Sydney Camm. Camm's aviation career began as a carpenter's apprentice with Martinsyde before progressing to Hawker in 1923 as a senior draughtsman.

The Hurricane's lineage began in the late 1920s, beginning with Air Ministry Specification F.20/27 for an 'interception single-seat fighter', which the manufacturers Armstrong Whitworth, Bristol, de Havilland, Fairey, Saunders, Vickers and Westlands all bid for as well as Hawker. Never going beyond the prototype, the Hawker F.20/27 was a single-seat biplane powered by a 520hp Mercury radial that first flew in August 1928. Simultaneously, the F.20/27 model was being redesigned to accommodate a new V12 in-line engine, namely the Rolls-Royce F.XI, later known as the Kestrel. The new fighter was called the Hornet and first flew from Brooklands in March 1929, by now powered by a 420hp F.XIC engine. Not long after, the Hornet was re-engined again with the 480hp Kestrel IS and in early 1930 was purchased by the Air Ministry for extended evaluation at Martlesham Heath. An order for 21 aircraft was placed by the Air Ministry in 1930, and the design was renamed the Fury. On 25 March 1931, the Fury I, in the hands of Hawker's chief test pilot George Bulman, first flew from Brooklands.

Breaching the 200mph barrier

The Fury was an outstanding fighter and was the first of its breed in RAF service to achieve 200mph. Prior to the addition of the Fury to its inventory, the RAF's quickest aircraft was the Hawker Hart light bomber, so the Fury was a vast improvement on contemporary fighters. The Fury was very popular with pilots, and its receptive flying controls made it an excellent aircraft for aerobatics. Production Furies were fitted with the more powerful 525hp Kestrel, which gave the aircraft a good climb rate of over 2,400ft per minute and a top speed of 207mph at 14,000ft. In May 1931 this beautiful aircraft entered service with 43 Squadron at Tangmere, remaining in the front line until 1938.

In the meantime, another new specification, F.7/30, called for a fighter capable of no less than 250mph at 10,000ft, armed with four machine guns and capable of operating day or night. Since the Fury had already been ordered by the RAF, it was effectively ruled out of this competition, but this did not

© Osprey Publishing • www.ospreypublishing.com

stop Camm, unwisely in the eyes of many in the aircraft industry, from pursuing further development of his sleek fighter. The specification was to be misinterpreted by many of the manufacturers who began development work on their designs, including Blackburn, Bristol, Gloster, Supermarine and Westlands. This misinterpretation, which was aggravated by the Air Ministry's preference for the liquid-cooled Kestrel IV (later Goshawk) engine, resulted in Britain's fighter development stalling during the early 1930s. The three main contenders for Specification F.7/30 were the Supermarine Type 224, Westland PV.4 and the Blackburn F.3. None of them came close to the proposed 250mph top speed, and the F.3, which never even flew, was only given an optimistic maximum speed of 190mph. All three, including the Type 244, which even R. J. Mitchell was disappointed with, did not result in a new fighter for the RAF. It was left to the Gloster Aircraft Company to design such a fighter, as during the fading days of the F.7/30 specification in 1935, Gloster managed to come up with the modified version of the Gauntlet, the Gladiator.

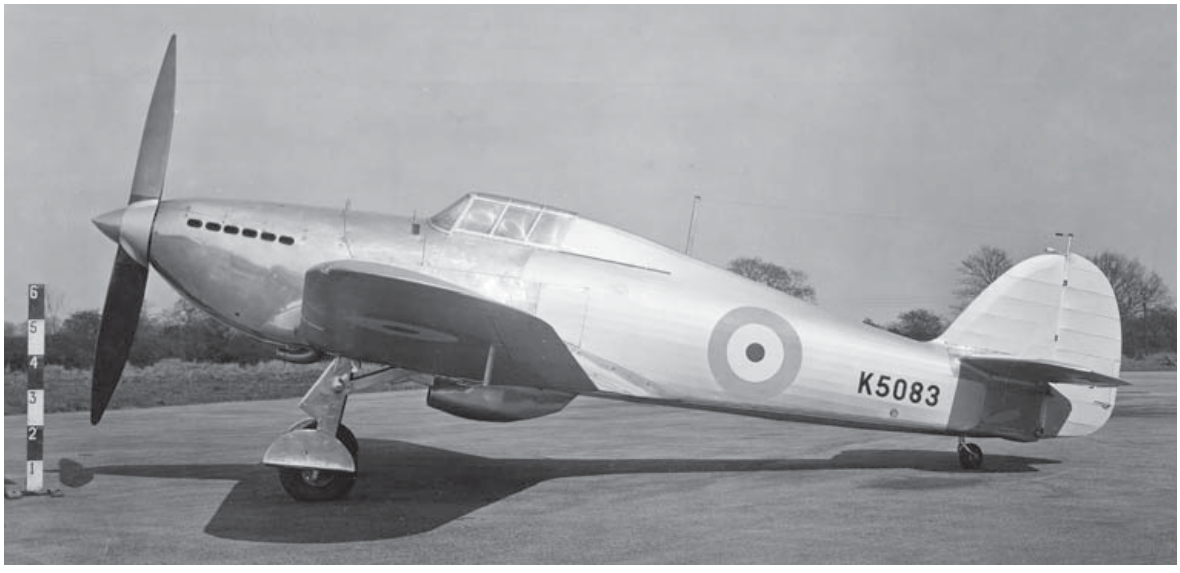
Hawker was already very busy meeting orders for the Hart light bomber and its variations, including the Demon fighter, Audax army co-operation aircraft and the Osprey general-purpose land-and-seaplane, as well as the Hardy, Hartebeeste (or Hartbee), Hind and Hector. This did not stop Camm from proceeding with a fine-tuned version of the Fury as part of the F.7/30 competition. First came what was to be known as the Intermediate Fury, of which one aircraft was built as a private venture and registered as G-ABSE. The aircraft was built to F.7/30 requirements, and various trial installations were incorporated so there would be as many 'unknowns' as possible when the specification aircraft took to the air. Various engines were fitted and its performance was encouraging. The new F.7/30 design was the PV.3, a slighter, larger version of the Fury that was powered by a 695hp Goshawk III steam-cooled engine and first flew on 15 June 1934. Overheating problems were solved by incorporating the steam condensers along the leading edge of the upper wing as well as a much smaller retractable radiator under the fuselage. Very little new ground was broken by the PV.3, which could still only manage 220mph, but many of its features were incorporated into the High Speed Fury that would result in the Fury II. The RAF ordered 98 Fury IIs, the first entering service in 1936.

F.36/34 Single-Seat Fighter – High Speed Monoplane

Sydney Camm had been mulling over the concept of a 'Fury Monoplane' since 1933, and, after sounding out several Air Ministry officials over the idea and receiving an encouraging response, he set to work on his next design. With

The Hawker Hurricane prototype K5083 prior to chief test pilot George Bulman carrying out the first taxi trials at Brooklands on 3 November 1935. Clearly visible are the original lower hinged undercarriage doors, original 'flimsy' canopy and tailpane strut. (*Aeroplane* via author)

© Osprey Publishing • www.ospreypublishing.com



Although the troublesome hinged undercarriage doors are still in place, the prototype is now approaching its final form. The canopy has now gained an extra strut, and landing and navigation lights are now in place as well as a radio, complete with mast, behind the cockpit. A rudder balance can just be seen up the port wing and a ring and bead gun sight is also fitted. (*Aeroplane* via author)

new aircraft technologies becoming available, the Air Ministry issued a new specification in May 1934. Designated F.5/34, the latest remit specified a monoplane fighter capable of at least 300mph with an armament of six to eight guns. F.5/34 was almost an exact match for the designs that both Camm and Supermarine's chief designer R. J. Mitchell were already creating.

Compared to earlier designs, which relied on the old Vickers machine guns that were constantly prone to jamming, the much more reliable American Colt/Browning was made available. The Vickers always had to be positioned where the pilot could get at it to clear a jam, but the 0.303 (7.7mm) calibre Browning's reliability meant that it could be positioned outboard in the wings in greater numbers.

Referring to the latest aircraft as 'Interceptor Monoplane to F.5/34', the Hawker design team at Canbury Park Road, Kingston set to work. Technical data was still lacking with regard to the Browning machine gun, so it was designed with a quartet of Vickers guns instead. In the background, however, the team was investigating how best to accommodate eight machine guns in the outer wings using Vickers gun dimensions. By June 1934, a one-tenth scale model was ready for testing in the compressed-air wind tunnel at the National Physics Laboratory at Teddington. Two months later, the results of the test proved the ability of the fighter to display very satisfactory aerodynamic qualities up to 350mph. The tests were carried out under the assumption that a PV.12 engine would be fitted, giving an all up weight (a.u.w.) of 4,600lb. By now Rolls-Royce confidently claimed that they could produce 1,000hp from the PV.12. During August 1934, Camm submitted the design, including potential performance figures and findings, to the Air Ministry.

Camm's design study must have been received by the Air Ministry with great enthusiasm because within weeks a more detailed specification was written around the design. The new specification, F.6/34, was received by Hawker in the last week of August, and by 4 September was formally tendered back to the Air Ministry under the name 'F.36/34 Single-Seat Fighter – High Speed Monoplane'. Events now began to unfold with speed, not only motivated by Hawker, but also by worldwide events, as it was increasingly looking like another world war was on the cards.

© Osprey Publishing • www.ospreypublishing.com

Enter the Rolls-Royce PV.12

On 17 November 1934, the very first manufacturing drawings for the fuselage were issued to the experimental shops so they could prepare the jigs. Before the month was over a slight complication was discovered, when Rolls-Royce informed Hawker that the PV.12's weight had increased by 80lbs. This was rectified by increasing the ammunition capacity by 400 rounds, which altered the aircraft's centre of gravity without moving the engine, raising the a.u.w. to 4,800lbs. More engine information was supplied on 18 December, when Rolls-Royce stated that the engine would produce a take-off rating power of 1,025hp at 2,900rpm. A week later, a spare PV.12 was supplied to Hawker to install into a mock-up that had been completed a couple of weeks earlier. The mock-up proved very useful in helping the designers and engineers with physical aspects of the cockpit layout, the pilot's field of vision, undercarriage retraction, cooling ducting, radiator position and gun mountings, which were still at this stage the Vickers guns.

With the mock-up taking centre stage, a final conference was held at Canbury Park Road between Camm and Air Cdre L. A. Pattinson, representing the RAF, who was AOC Armament Group. The focus of these final discussions was the armament, which Camm was very anxious to replace with a wing-mounted battery in the outer wings rather than the cumbersome Vickers. Pattinson was well aware of how disappointing the Vickers was, but stated that a satisfactory licence to use the Browning was still yet to be achieved. Air Ministry representatives had only recently returned from America with terms for a licence, which was being studied by the Birmingham Small Arms (BSA) Company.

Hawker was awarded Contract No.357483/34 on 18 February 1935 to produce a single fighter, which was to be registered as K5083. A remarkable feature of this contract appeared under the appendix covering 'Standard of Preparation'. In this section, a statement read that 'no decision had yet been reached regarding the provision of armament'. It was agreed six weeks after the contract was issued that no armament should be fitted, but equivalent ballast to represent two fuselage-mounted Vickers and a Browning was to be employed in each wing. At this stage no licence had been issued to produce the Browning in Britain but, considering the earlier decision about ballast, it is puzzling as to why ballast for the full battery of eight American guns was not

George Bulman turns K5083 into the wind as he prepares to depart Brooklands on another early test flight. The same scene occurred on 6 November 1935 for the first flight, which was only witnessed by 80 onlookers, such was the level of secrecy surrounding the new fighter. (*Aeroplane* via author)

© Osprey Publishing • www.ospreypublishing.com

installed instead. It was not until July 1935 that the situation was finally resolved following the issue of a licence to BSA to produce the Browning.

Construction of K5083 continued at Canbury Park Road, conveniently taking place below the design team's offices. Flight testing of the PV.12, which was from now on referred to as the Merlin, had been first carried out in Hart K3036 on 21 February 1935. Progressive development of the engine had revealed that a large radiator would be needed, but Hawker had other ideas. Rather than a high-drag obtrusive unit, it was proposed that a duct was fitted under the fuselage that would speed up the airflow over the radiator. The best way to achieve this was to make sure that the air was not disrupted before it entered the duct and onwards to the radiator. A very clean fuselage undersurface was maintained and 'D' shaped doors were fitted to smooth over the retracted main wheels.

K5083 was structurally complete by August 1935 and was now prepared for skinning, which would take another six weeks. Rolls-Royce Merlin C engine No.11 was delivered and fitted around the same time, and once its preliminary systems were checked, the aircraft was prepared to be moved by road to Brooklands. On 23 October 1935, K5083, minus its wings and secured firmly under a tarpaulin sheet, was transported to the flight assembly shed at Brooklands. The fabric-covered wings, filled with ballast rather than guns, were refitted and controls reconnected. The retractable undercarriage, including tailwheel, was tested, and the Merlin engine was brought to life.

First Flight

On 3 November 1935, George Bulman taxied the fighter out onto the Brooklands grass, so beginning the steady task of acclimatising himself to the aircraft. His first impressions centred on the improved visibility; he said that 'there was more daylight in the cockpit' and described the view as 'marvellous'. Bulman later told Camm that he was particularly impressed with the ease of disembarkation.

A potential set back reared its head on 4 November, when Rolls-Royce informed Hawker that the Merlin had failed to pass its 50-hour certification test. A quick inspection had failed to reveal why the engine lost power after just 40 hours. After consultation, Bulman suggested that the first flight should be made with a certified engine providing there was no sign of a drop on the magneto. Bulman also said that the oil filter should be checked for signs of metal fragments after the first and every subsequent flight until Rolls-Royce

With George Bulman at the controls, the prototype Hurricane K5083 is captured high above the clouds in November 1935. Note the original style radiator intake, retractable tailwheel and lack of armament. (*Aeroplane* via author)

© Osprey Publishing • www.ospreypublishing.com

had discovered the reason for the problem. None of the Hawker or Rolls-Royce engineers disagreed with Bulman's cautious but positive approach.

On 6 November Bulman, with approximately 80 onlookers, taxied K5083 out for its first flight. No press were informed, let alone invited, and photography was not permitted, such was the level of secrecy surrounding Hawker's latest product. Taxiing to the end of the runway, the silver monoplane turned into the wind and, with a roar from its Merlin, seemed to be into the air and over the banking of the old racing circuit in no time at all. Bulman was instantly impressed with the fighter, and was content to carry a general handling flight, although he did perform a slow roll and reached 300mph in a gentle dive with ease. He also carried out a stall test with undercarriage and flaps down; the aircraft stalled at 80mph, from which recovery was quickly achieved by slight forward pressure on the stick. After just over half an hour, Bulman floated back over the old banking and, with its big Watts propeller seemingly hardly turning, the aircraft performed a gentle three-point landing. Bulman was greeted by a jubilant Tommy Sopwith and Sydney Camm, who drove across the airfield in a Roll-Royce.

Incredibly, Bulman never filed an official flight test report for this historic event, instead choosing to jot down his impressions on a secretary's note pad! He briefed Camm about the flight and included comments about engine temperatures, which built up rapidly while taxiing. The temperature also increased quickly following the lowering of the flaps, suggesting that the airflow was being retarded at the rear of the radiator. These were merely comments; his major complaint was about the aircraft's canopy, which constantly creaked and flexed during flight. Once Bulman had completed his brief, he gave Camm a broad grin, playfully punched him on the shoulder and said, 'Syd, you've most certainly got a winner here!' Camm, however, did not feel the same way at this stage.

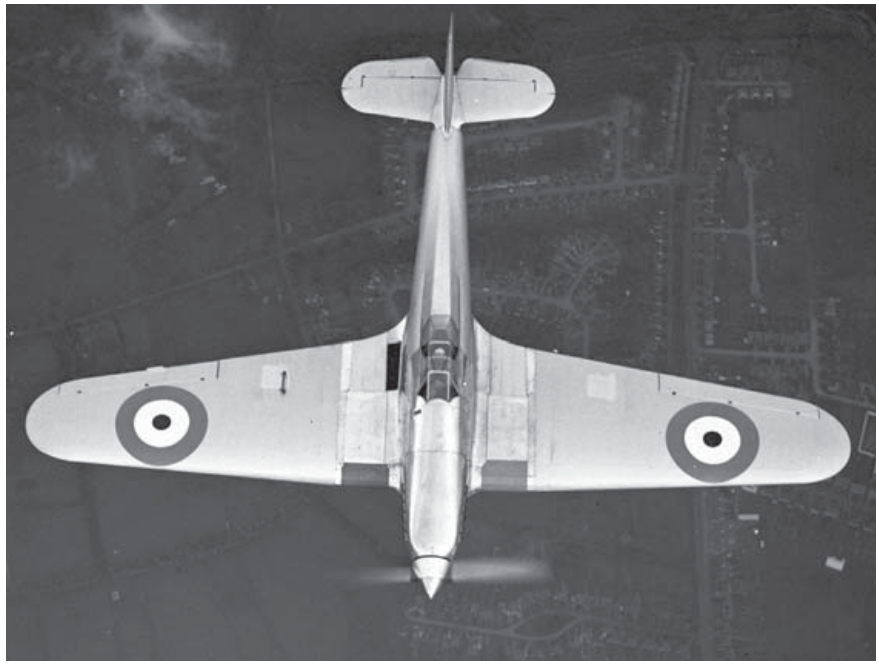
A Troublesome Child

The canopy was temporarily modified by the addition of an extra set of struts, but the overheating problems would only be resolved by redesigning the entire radiator fairing. The 'D-shaped' undercarriage doors proved to be more trouble than they were worth and were removed. Initially, K5083 was also fitted with a pair of tailplane struts, as tail flutter was anticipated in a dive. This never occurred and the struts were removed.

Five more flights were made by Bulman in November and on 6 December a provisional airworthiness certificate was finally issued for the Merlin C engine. The Merlin created a host of problems, including a failure of the supercharger bearings, the collapse of the automatic boost control capsules, and the regular breaking of valve springs. When one of the latter fell into a cylinder, engine No.11 was replaced by No.15. It had already been decided at an early stage that the Merlin C would only be used for test purposes and the aircraft was planned for the newer F variant, later known as the Merlin I.

Undoubtedly influenced by world events, the Air Ministry was very keen to see K5083 make its first scheduled visit to the Aeroplane and Armament Experimental Establishment (A&AEE) at Martlesham Heath. K5083 was duly delivered by Bulman on 5 March 1936, the same day the Spitfire made its maiden flight from Eastleigh in the hands of Joseph 'Mutt' Summers. The aircraft was pored over by RAF technical officers with a fine toothcomb before a single designated test pilot was assigned to evaluate the aircraft in flight. This

© Osprey Publishing • www.ospreypublishing.com



An outstanding view, displaying the purposeful lines of the Hawker Hurricane. K5083 is captured over the London suburbs with George Bulman at the controls. The ultimate fate of K5083 is not clear, but before the aircraft became an instructional airframe the prototype flew for 153 hours and 25 minutes. (*Aeroplane* via author)

highly responsible task fell upon the experienced shoulders of Sgt Samuel 'Sammy' Wroath.

Engine problems still dogged the fighter during its trials at Martlesham, and two further Merlin Cs were fitted. Thankfully, the majority of the snags were rectified after a visit to Rolls-Royce at Hucknall following K5083's return from Martlesham in April 1936. In the meantime, the Flight Section of the A&AEE, under the command of Sqn Ldr D. F. Anderson DFC (Distinguished Flying Cross) AFC (Air Force Cross), had already submitted the results of its trial to the Air Ministry. Some of its details showed that K5083 achieved a maximum speed of 315mph at 16,200ft and had reached 15,000ft in 5 minutes 42 seconds. 20,000ft had been reached in 8 minutes 24 seconds and a service ceiling of 34,500ft was estimated; all of these figures were comfortably beyond the original F.36/34 specification. Generally, all of the departments involved in K5083's initial trial were impressed with the aircraft, which did not even receive any criticism for its flimsy canopy!

It was not long before a steady line of Air Ministry officers began to arrive at Canbury Park Road to discuss when production could begin. Hawker, along with several other major manufacturers, was already involved in Expansion Scheme E, which was an order for 500 fighters and 300 bombers to be finished by late 1937. It was already clear that most of this order was obsolete, but it could not be cancelled because the scheme also contained large orders for Gladiators, Hinds, Wellesleys and Whitleys, all of which were needed by the RAF.

Hawker was in no mood to wait for a decision to be made by the Air Ministry, so, without delay, the company began to subcontract its own commitments. Hector and Audax production was diverted to Westlands and the Fury II to General Aircraft Ltd. The latter was also brought in to carry out Hart and Hind conversions to trainers. This manoeuvring managed to free 24,000 square feet of floor space at Canbury Park Road for new production and a further 14,000 square feet at Brooklands for assembly and finishing.

© Osprey Publishing • www.ospreypublishing.com

Frustrations were building, as by May 1936 no production order was forthcoming from the Air Ministry. Taking the initiative, Hawker decided to begin production arrangements regardless, starting with the recruitment of 280 skilled machine operators and fitters and the purchase of the necessary aluminium and steel tubing to produce 1,000 fighters. It was a brave but confident decision.

Hawker notified the Department of Development and Production of what the company was about to do, and the administrative cogs of the Air Ministry finally began to turn at high speed. Without delay, a draft proposal for Production Scheme F was drawn up and released on 1 June 1936, stating a requirement for 1,000 fighters. Just three days later, a formal contract, No.527112/36, was drawn up for 600 'monoplane fighters'. By 8 June, the fuselage manufacturing drawings had been issued to the production shops. It was not until 27 June 1936, however, that the aircraft was given a proper name, on the same day that the fighter made its first public appearance at Hendon. Traditionally, fighter aircraft to date had been given aggressive names such as Bulldog, Fury and Gladiator, but both Sopwith and Camm thought that names associated with violent winds would be no less aggressive. Thus the new fighter was named the Hurricane.

Refining the Merlin

Following the results of the Martlesham trial, all modifications revolved around the troublesome engine. Rolls-Royce was now hard at work trying to refine the Merlin I while K5083 was refitted with Merlin C No.17. The prototype now found itself dismantled and back in the Kingston workshop in late July 1936. It was fitted with a set of fabric-covered eight-gun wings, a ring-and-bead gun sight, and the tailplane struts were removed. By 17 August, it was back at Brooklands again and, after more test flying, the Hurricane was prepared for a second visit to Martlesham Heath for its final service acceptance trails. However, the Air Ministry was not happy with the progress of the Merlin, especially when Rolls-Royce stated that its problems could be resolved by reducing its rated altitude and lowering the time that the unit could be flown at full power.

Thankfully, in the background, Rolls-Royce had already been developing the Merlin G (Merlin II), which had a host of modifications including new camshaft mountings, redesigned rocker and valve gear, improved supercharger bearings, and much more. It was therefore decided to divert the Merlin Is to the Fairey Battle while the new 1,030hp Merlin IIs would power the Hurricane and Spitfire. The new engine would cause quite a few design issues for Camm, including a new nose contour, a new radiator fairing, and the repositioning of the glycol coolant header tank.

Further flight trials were made by Bulman and test pilot Philip Lucas during early November, with great emphasis on spinning. Now fitted with a new rudder, K5083 was put through a limited spinning trial that revealed an interesting anomaly, resulting in further post-production modifications. Recovery, although easier from a right-hand spin, was well below the minimum required by the RAF at the time, but test pilots were surprised to discover that it was improved when the tailwheel was down. This indicated that some benefit was achieved by unstable airflow over the base of the rudder. After this had been duly noted, the Hurricane was finally delivered to Martlesham in March 1937.

© Osprey Publishing • www.ospreypublishing.com

Hawker Hurricane Mk I, production aircraft No.1 L1547, at Brooklands on 12 October 1937, the day of its first flight by Philip Lucas. The aircraft later served with 312 (Czech) Squadron but was lost on 10 October 1940 over Oglet, not far from Speke airfield, following an engine fire. The pilot, Sgt O. Hanzlicek, sadly drowned in the Mersey after bailing out. (Via author)

The Hurricane was now fitted with eight guns, their ammunition feeds, a radio, a redesigned radiator fairing, a fixed tailwheel, a heavy duty bulletproof windscreen, and a sliding canopy. Wroath began his second trial on 3 April in a model still fitted with a Merlin C engine. He had received clear instructions that the performance and handling with regard to the Merlin should not cloud the aircraft's final service report. In the end, the Hurricane passed the service trial with little drama. The RAF was very happy with how the aircraft performed during a short gun firing course from Eastchurch. The Hurricane took part in 18 live sorties over the range at Leysdown on the Isle of Sheppey, all of which were performed without a single stoppage. After visiting all of the RAF's specialist establishments, K5083 was taken on charge by the RAF at Martlesham Heath on 25 May 1937, now no longer the property of Hawker Aircraft Ltd. The aircraft had served its purpose well for Hawker, but by then did not represent the forthcoming production variant that was being built in quantity at Kingston.

Sammy Wroath continued to fly K5083 during his tour at Martlesham Heath and, only four days after the aircraft became an RAF machine, he was displaying it at the Empire Air Day displays at Felixstowe and Martlesham. The prototype was also put forward as being representative of a modern RAF fighter later in the year, following a request by MGM for an aircraft for its flying sequences in a new film. The film, whose cast was led by Clark Gable and Myrna Loy, was originally called *Shadow of the Wing* but was issued as *Test Pilot* instead. Camera crews arrived at Martlesham in late August 1937

B

1. THE PROTOTYPE

The prototype Hurricane K5083 in its earliest form, as it would have appeared after being rolled out at Brooklands on 6 November 1935.

2. 111 SQN MK I

Hurricane Mk I L1555 as flown by 111 Squadron's commanding officer Sqn Ldr J. W. Gillan. It was in this aircraft that Gillan made his record-breaking flight from Turnhouse to Northolt on 10 February 1938.

3. 1 SQN MK I

Several aces were created over France in mid-1940, including Sgt A. V. 'Taffy' Clowes of 1 Squadron, who had seven victories under his belt by June 1940. P3395 was his personal aircraft during that period; it survived the battles of France and Britain before being wrecked in March 1942 at Ternhill.

4. 615 SQN MK I

Mk I L1592 had a remarkable flying career, which began with 56 Squadron at North Weald in May 1938. The fighter went on to serve with seven operational squadrons (17 Squadron twice) and four second line/training units before it was retired. The fighter today hangs from the roof of the Science Museum.

1

2

3

4

© Osprey Publishing • www.ospreypublishing.com

and, before filming ended, Wroath had flown the Hurricane for 14 flights, his face conveniently concealed behind an oxygen mask and helmet.

Little is known of the prototype's history from this point, other than that Sammy Wroath flew it on several more occasions during the summer of 1937. His final flight was on 12 October 1937, which, significantly, was the very day that the first production Hurricane Mk I L1547 was rolled out of the Brooklands flight shed for its maiden flight in the hands of Philip Lucas.

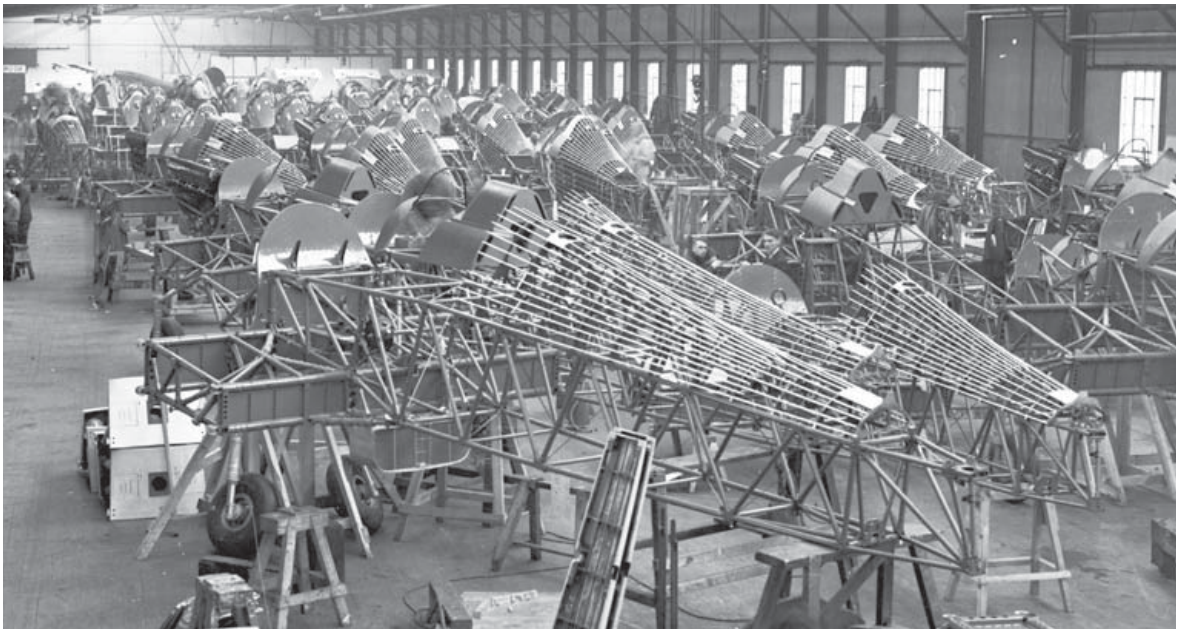
TECHNICAL SPECIFICATIONS

The Anatomy of a Legend: Overview of the Hurricane

The Hurricane was a single-engine, single-seat, low-wing monoplane powered by a supercharged Merlin V-12 in-line liquid-cooled engine. It was of all-metal construction and its flying surfaces and rear fuselage were fabric-covered. The latter feature also included the outer wings on early Hurricanes while later aircraft had all-metal covered wings. The fighter was fitted with a retractable undercarriage (including the tailwheel on the very early aircraft only) while the armament was fitted inside the wing at first, but below it on later aircraft as well.

The Fuselage

The entire fuselage was made up of a metal framework of round tubes that were shaped to form squared off sections at the ends and then bolted together to form a box, the sides of which formed Warren trusses. Further strength, especially in the rear fuselage, was supplied by diagonal wires between tubular joints, each with its own screw tensioner. Fitted to the rear fuselage framework were 11 metal frames, tapering rearwards, in which several stringers were attached. On this was placed doped fabric. No longerons



Approximately 30 Hurricane fuselages are visible in this photo taken at Kingston-upon-Thames in 1937. In all, over 14,500 Hurricanes and Sea Hurricanes were built, themajority by Hawker at Kingston, Brooklands and Langley and the Gloster Aircraft Company at Hucclecote. The Austin Motor Company at Longbridge built the remainder. (*Aeroplane* via author)

© Osprey Publishing • www.ospreypublishing.com

were fitted as the longitudinal strength was well catered for by the Warren truss structure.

The forward part of the fuselage used a triangular part-truss layout complete with four engine bearer pads on the upper components. Attached to the forward structure was a line of 'thump-stud' sockets to fix the external engine and ancillary access panels in place.

Behind the cockpit was a large sheet of armour to protect the pilot and in front was an armoured bulkhead. A 'break-out' panel was placed on the starboard side of the cockpit below the sliding canopy.

The Wings

Centre-section

The centre-section of the Hurricane's wing was an all-metal twin-spar structure that was attached to the fuselage via the main Warren trusses. A pair of fuel tanks was located between each main spar, while on the port side the oil tank was positioned in front of the spar.

The undercarriage wells were also between the main spars, in the lower part of the centre-section. The hinge-mounted flaps were attached to the trailing edge of the centre-section on the lower edge of the rear spar. The section was blended into the fuselage with a radiused fillet joint and was completely metal-skinned.

Outer wings

Once again, these used a two-spar design, but there was a diagonal Warren truss between them and the main nose frames along the leading edge. Chordwise metal frames created the aerofoil section, which was metal skinned. The ailerons were hinged to the trailing edge of the rear spar.

Aircraft fitted with cannon did not have Warren trusses, in order to create more room for access to the weapons, gun bay and ammunition. Strength was retained by fitted secondary span-wise spars.

Strong points were attached to the front and rear spars, inboard of the guns, for fuel tank pylons or bomb racks. Four extra strong points were fitted under the spars on later Mk IIs and all Mk IVs for a four rail Rocket Projectile (RP) pack.

The Undercarriage

The retractable undercarriage of the Hurricane was made up of a single-oleo semi-pneumatic Vickers strut with a Dunlop or Lockheed wheel mounted on the inboard side. The strut was positioned at the extreme outer edge of the centre-section and retracted inwards by a Hawker mechanism that was actuated by a Dowty hydraulic jack. As the leg retracted, a shortening drag strut pulled the undercarriage slightly aft by seven degrees to clear the main spar before entering the wheel well.

The wheels were fitted with either Dunlop or Lockheed pneumatic brakes as standard and, other than very early Hurricane Mk Is, the Dowty oleo-sprung lever-suspension tailwheel was non-retractable.

Metal fairing panels were attached to the main undercarriage leg and, once retracted, enclosed the wheel well, with the exception of a small portion of the tyre that remained visible from below. The early prototype had an additional hinged panel that enclosed the tyre completely, but it was later found to be of no aerodynamic advantage and was subsequently removed.

© Osprey Publishing • www.ospreypublishing.com

Powerplant – The Song of a Merlin

The Rolls-Royce Merlin, originally known as the PV.12, was a single-stage supercharged V-12 liquid-cooled engine. After Merlin Mk III variants, the engine was fitted with a two-stage supercharger.

Each of the 12 cylinders had two spark plugs and four valves, while the engine's overhead camshafts were driven from the rear. The exhaust manifolds were also grouped in pairs per cylinder with stub-type ejectors.

An 18-gallon coolant header tank with a water and methanol mix was positioned on the upper starboard side of the nose. A big radiator was located in a large fairing on the centreline directly under the wing-section aft of the landing gear wells. The oil reservoir tank was fitted into the port wing centre-section. Air for the carburettor was supplied via an up-draught trunk from an intake to the rear and below the engine.

The propeller reduction gear, positioned on the front of the Merlin, transferred its power to a splined universal propeller shaft. The latter gave the Hurricane the flexibility to use the Rotol, de Havilland or Hamilton Standard three-blade metal propeller. Those aircraft fitted with the Rotol propeller also had a constant speed unit at the front of the engine.

Hurricane Prototype (K5083)	
Power	One 990hp Rolls-Royce Merlin 'C' engine
Dimensions	Span 40ft Length 31ft 6in Height 13ft 6in (propeller vertical)
Weights	Tare 4,129lb Normal Loaded, 5,672lb
Performance	Max Speed 315mph at 16,200ft Climb Rate 15,000ft in 5min 42sec, 20,000ft in 8min 24sec Range, 565m Service Ceiling, 34,500ft (estimated)
Fuel Capacity	107.5 gallons
Production	1; f/f K5083 6 Nov 1935

MARK BY MARK

Hurricane Mk I

The first variant of the Hurricane, the Mk I, was in production for over three years, and, as a result, the early versions differed in many ways from those that left the line much later on. The aircraft that were first delivered to 111 Squadron were very basic machines, powered by the Merlin II, fitted with a two-blade Watts fixed pitch wooden propeller, fabric-covered outer wings, and a ring-and-bead gun sight. Other features that were lacking on the early aircraft were self-sealing fuel tanks and protective armour for the pilot. The eight .303in Browning machine guns were positioned outside the arc of the propeller and therefore they did not need to be synchronised.

The first batch of aircraft was also fitted with a retractable tailwheel, but following further flight testing and experience during service use, it was agreed that the Mk I would need a larger rudder to improve handling, especially

© Osprey Publishing • www.ospreypublishing.com

The early production Merlin II-powered Hurricane Mk Is were fitted with a two-blade Watts fixed pitch propeller and a retractable tailwheel, as shown by Sqn Ldr Gillan's L1555 over Northolt in early 1938. L1555 came to grief while serving with 56 OTU after running out of fuel and crash landing near Long Sutton, a mere four miles short of its home airfield at Sutton Bridge, Lincolnshire. (*Aeroplane* via author)

during a spin. To solve this, a ventral keel was added to the rear lower fuselage, which made the rudder taller but also made the tailwheel fixed rather than retractable. This modification was retrofitted to many of the early machines and became standard on all subsequent aircraft.

From 1939 onwards, the powerplant was replaced by the 1,310hp (at 9,000ft) Merlin III, crucially fitted with a 'universal' propeller shaft. The latter gave the Hurricane the facility to use a de Havilland (Hamilton Standard) three-bladed, two-speed metal propeller, although this was an interim improvement that provided only marginally better performance. Significant improvement had to wait for the introduction of the Rotol constant-speed, three-blade, metal propeller combined with new 'ejector' type exhausts.

The early Mk I's fabric-covered outer wings were later replaced by metal skins, which also saw the gun bay access panels change shape. By mid-1940, pilot protection was becoming paramount, so an armoured-glass panel was fitted into the windscreen along with 70lb of armour plate around the cockpit. Fuel tanks in the wing centre-section and the forward gravity-feed tank in front of the cockpit were also given some protection from enemy rounds.

Equipment changes were inevitable. At first, these concentrated on the radio, which was originally a TR9 HF type but, by mid-1940, these were replaced by the T/T Type 1133 VHF. IFF (Identification Friend or Foe) equipment was fitted from mid- to late 1940, and the original rod-type radio aerial was replaced by a tapered mast.

The later-built Hurricane Mk Is would see the most action of the entire breed, being at the forefront of the closing stages of the battle of France in May and June 1940 and through the Battle of Britain from July to October. It was a popular machine with its pilots, its rate of turn being particularly useful against the Bf 109E and the Bf 110. The first of these was up to 30mph faster, especially above 15,000ft, but the Hurricane was easy to fly for a big tail-dragging fighter and even in inexperienced hands during the Battle of Britain could still hold its own.

Mid-1940 also saw the introduction of the Mk I 'Tropical' variant, designed for operations in hot, dusty climates. This version was clearly distinguishable from the standard by the large Vokes filter fitted under the nose, designed to filter air passing into the carburettor. The 'Tropical' made its debut in North Africa and Malta and would see service over Mediterranean skies through to the war's end.

© Osprey Publishing • www.ospreypublishing.com

Sea Hurricane Mk IA, Z4852, first entered service with the Merchant Ship Fighter Unit, followed by impeccable service with 55 OTU at Annan, Dumfries and Galloway, until SOC on 27 May 1944. (Via author)

The Hurricane Mk I 'Floatplane'

One aircraft was part modified (Dwg No.13440) and fitted with a pair of Blackburn Roc floats. The concept was raised during the Norwegian campaign, but scrapped by June 1940 following that country's fall. The aircraft had a proposed maximum speed of 210mph at 10,000ft.

The Hillson FH.40 Slip-Wing Hurricane (Mk I)

Originally supplied to Canada in late 1938, L1884 served with 1(RCAF) (Royal Canadian Air Force) Squadron as No.321 before being shipped back to Britain in 1940. On its return, the aircraft was modified by F. Hill and Sons Ltd with a second wing of the same dimensions mounted above the fuselage in a biplane arrangement. The extra 'slip-wing' was designed to provide extra lift for a Hurricane overloaded with fuel; once at its cruising altitude, the wing would be jettisoned. The theory was that the Hurricane could then continue on non-stop to Malta or North Africa where extra fighters were desperately needed, avoiding the costly and dangerous passage by sea.

By the time the project had achieved what it set out to do, the need for extra aircraft in the Mediterranean theatre had subsided, but the Hillson FH.40 remained at Boscombe Down for further trials until January 1944.

The Sea Hurricane Mk Ia (The 'Hurricat')

The Hurricane was a natural choice for the Royal Navy, which was desperately in need of modern fighters to operate from its carriers. Compared to the Spitfire, the Hurricane was much easier to handle and its wide-track undercarriage was perfectly suited to landing on carriers.

The first Hurricanes to serve with the FAA (Fleet Air Arm) were standard Mk Is transferred directly from the RAF, but, following a decision in November 1940, a more specialised aircraft was suggested. The idea was to build Fighter Catapult Ships (FCS), which would carry a pair of 'expendable' Hurricanes that could be launched on sighting an enemy aircraft, such as the Fw 200 'Condor'. The aircraft was designated the Sea Hurricane Mk Ia, and the modification involved fitting catapult spools, FAA standard radio equipment and around 80 other minor changes. Thirty-five aircraft were ordered at first and the conversions were carried out by Hawker, Gloster or

© Osprey Publishing • www.ospreypublishing.com

General Aircraft Ltd; the latter would later carry out the majority of the Sea Hurricane conversions.

While the FCS were crewed by the Royal Navy and the aircraft flown by FAA pilots, the Sea Hurricanes were also flown from CAMs (Catapult Aircraft Merchantmen), which were crewed by civilians while the aircraft were flown by RAF pilots.

Operating a Sea Hurricane from these merchantmen was a 'one-way only' operation, as there were no facilities to recover the aircraft after it was launched. If the aircraft was not in range of an airfield, the pilot had only two options; to bail out or to ditch the aircraft near an Allied ship. The latter option was particularly hazardous because of the Hurricane's large under belly radiator intake, which tended to dig into the water on touchdown and pitch the fighter straight down, often sending the aircraft under the surface almost instantly.

The first successful operation involving a Sea Hurricane Mk Ia came on 2 August 1941 when Lt R. W. H. Everett was launched from the FCS HMS *Maplin*. Everett's quarry was an Fw 200, which, after a very long chase and avoiding as much defensive fire from the large bomber as possible, he set on fire to crash into the sea a few minutes later. Everett's Sea Hurricane had taken several hits and was losing oil, so the FAA pilot decided to take to his parachute instead of risking a ditching. However, the fighter had other ideas. Everett made several attempts to bail out with the aircraft inverted, but the Sea Hurricane kept pitching down, forcing Everett back in his seat. Left with no option but to ditch, Everett came down near an Allied destroyer, only for the fighter to pitch into the sea and disappear below the waves. Not the strongest of swimmers, Everett managed to drag himself to the surface to be rescued a few moments later. He was later awarded the DSO for becoming the first pilot to destroy an Fw 200 'Condor' using a catapult Sea Hurricane.

The Sea Hurricane Mk Ib

The first dedicated Sea Hurricane for the FAA was the Mk Ib, which was fitted with catapult spools and an arrestor hook and was designed to be operated from carriers. The first example was a Canadian-built Mk I (later Mk X), P5187, which first flew as a Sea Hurricane Mk Ib in March 1941.

Full production began from May 1941 onwards and by October 120 Mk Ibs had been completed. However, included within this number are several early Hurricane Mk IIas and Mk IIbs and a handful of Canadian-built Mk X, XI and XIIs. This has made the exact definition of a Sea Hurricane very difficult. The general consensus is that a Sea Hurricane Mk Ib is 'any Hurricane which possessed an arrestor hook and whose gun armament did not protrude forward of the wing leading edge' (i.e. a 20mm cannon). The armament reference was introduced when the Admiralty ordered 100 Merlin III-powered Sea Hurricane Mk Ibs to be re-armed with 20mm Oerlikon cannon; this variant would be designated the Mk Ic.

By the end of 1941, the FAA could boast four squadrons of Sea Hurricane Mk Ibs, which finally gave the Royal Navy the opportunity to phase out the dependable yet now obsolete Fairey Fulmar.

Hurricane Mk IIa Z2346 remained in the hands of Hawkers and Rolls-Royce for trials work. It is seen here at Boscombe Down on 20 November 1940. After extensive trials flying throughout its career, the fighter, which never fired a shot in anger, was SOC on 19 July 1944. (Via author)

© Osprey Publishing • www.ospreypublishing.com

The Sea Hurricane Mk Ic

As mentioned above, the Sea Hurricane Mk Ic's obvious difference from the earlier marks was its prominent 20mm Oerlikon cannon, of which it had a pair in each wing. These wings were from a standard Hurricane Mk IIc and fitted to a Hurricane Mk I fuselage. The Sea Hurricane Mk Ic was also fitted with catapult spools, an arrestor hook and general naval equipment, and was operational from the Royal Navy's carriers from early 1942.

Powered by a 1,030hp Merlin III engine, the heavily armed fighter could still manage 296mph at 15,000ft. This was a vast improvement over the Fulmar, which was also less manoeuvrable.

Hurricane Mk I	
Power	One 1,030hp Merlin II 12-cylinder engine; later the Merlin III was used
Dimensions	Span 40ft Length 31ft 4in Height 13ft 2in (Watts propeller, blades vertical) Wing Area 258sq ft
Weights	Merlin II: Tare 4,743lb; Normal Loaded 6,218lb Merlin III: Tare 4,982lb; Normal Loaded 6,447lb (Rotol propeller); 6,499lb (DH two-position propeller)
Performance	Max Speed 316mph at 17,500ft Climb Rate 2,200ft/min Service Ceiling 33,200ft
Armament	Eight 0.303in Browning guns in the wings
Production	3,844; f/f L1547, 12 Oct 1937
Serial prefixes	L, N, P, R, T, V, W and Z

Hurricane Mk II, IIa, IIb, IIc and IId

The Mk II

The Hurricane was designed from the outset to be modified in contrast to the 10-year evolution of the Spitfire, which was developed virtually beyond recognition. The designers at Hawker were well aware that the Hurricane

C

1. 87 SQN MK IIC

Sqn Ldr D. G. Smallwood's Hurricane Mk IIC BE500, which was his personal aircraft during his tour as commanding officer of 87 Squadron. Smallwood survived the war and left the RAF as an air marshal, while his mount later served with 533 Squadron and in the Far East before being SOC in August 1944.

2. 402 SQN MK IIB

BE485, a Mk IIB that served with 402 (Winnipeg Bears) Squadron at Martlesham Heath, Ayr, Southend and finally Warmwell. From Warmwell the Canadian pilots strafed and bombed anything enemy-related that moved in Northern France during late 1941 and early 1942.

3. 880 SQN MK IB

880 Squadron was formed in January 1941 as a fighter squadron, destined to serve with HMS *Indomitable* from late 1941 through to mid-1943. The squadron operated the Sea Hurricane Mk Ia and Mk Ib. The latter mark is depicted here with AF974.

4. MK II G-AMAU

Another Hurricane that was destined to have a very long flying career, despite being the last one built, is Mk IIc PZ865. Registered as G-AMAU, the aircraft was never issued to the RAF and took part in several air races during the 1950s before being restored back to its original military appearance in the 1960s.

© Osprey Publishing • www.ospreypublishing.com

1

2

3

4

© Osprey Publishing • www.ospreypublishing.com

A Hurricane Mk IIb during trials at Boscombe Down, armed with a pair of 500lb GP bombs and 12 .303in machine guns. The position of the extra pair of machine guns, although the ports are blanked off, can be seen on the port wing, to the right of landing light. The gun's spent case exits are visible within the roundel. (Via author)

could be improved, but this was to be carried out with the minimal amount of modifications, which could unnecessarily complicate the design and, in turn, cause production delays.

With the arrival of the Merlin XX engine, Camm was given the opportunity to improve the performance of the Hurricane without carrying out time-consuming and costly changes. The XX's main feature was that it was fitted with a two-speed supercharger, which could be selected by the pilot depending upon what altitude was being flown. Above 18,000ft, for example, the pilot could select a 'Full Supercharger' rating, which gave the Hurricane a top speed of 339mph at 22,000ft, almost on a par with the Bf 109E. At lower altitudes, a 'Moderate Supercharger' was selected that gave optimum performance, although as the Mk II was being introduced, the Hurricane was ironically more often than not being used low down in the fighter-bomber role, so that the advantage of the Merlin XX was not fully exploited.

The new engine and its ancillary equipment would prove to be a squeeze to fit into a standard Mk I airframe, so to help accommodate it the forward centre section was lengthened by a few inches. The carburettor air intake was also in a slightly different position, being three inches further back than the Mk I. Rather than pure glycol as used in the earlier Merlin engines, the XX demanded a 70 per cent to 30 per cent glycol mix, which helped to take the pressure off the production of this valuable commodity. A bigger radiator was also needed for the cooling demands of the XX and a new circular oil cooler was also designed.

The Mk II would become the most prolifically built of all Hurricane marks, which began with the prototype, a converted Mk I P3269, first flown on 11 June 1940. As with the previous mark, the lengthy production of the Mk II saw several subtle modifications being made, including a new tailwheel leg and a modified spinner.

The Mk II began to arrive en masse with RAF squadrons during the closing stages of the Battle of Britain in the autumn of 1940, when Hawker began to receive massive production orders for the new fighter. 605 (County of Warwick) Squadron at Croydon was the first unit to receive the Mk II from November 1940.

The Mk IIa

The very early Mk IIs were nothing more than a Mk I fitted with the Merlin XX engine, still sporting the original eight .303in machine-gun arrangement,

© Osprey Publishing • www.ospreypublishing.com

so at first they were called the Mk IIa Series I. A few of the early machines saw the introduction of the 'universal wing', which was redesigned to carry a host of underwing stores. On each side was a pylon for carrying fuel tanks, RPs (Rocket Projectiles) or gun pods. This obviously gave the Hurricane considerably more clout and would help the aircraft become a useful fighter-bomber machine over Northern Europe before the arrival of its younger stable mate, the Typhoon. The aircraft fitted with the 'universal wing' were officially designated the Mk IIa Series II.

The Mk IIb

The 'universal wing' also gave the Hurricane an increased internal armament capacity by being able to carry an additional pair of .303in machine guns on each side. The Mk IIb retained the original eight gun armament with the addition of two further machine guns outboard of the originals, giving an impressive six guns per wing.

56 Squadron at North Weald in Essex was the first unit to receive the Mk IIb in February 1941, which flew alongside the Typhoon from September, but by March 1942 the mark was withdrawn from the squadron. By the middle of 1941, Mk IIbs were serving with 20 RAF squadrons.

The Laminar Flow Mk IIb

One of the longest serving RAF Hurricanes (disregarding the Battle of Britain Memorial Flight's [BBMF] LF363 and PZ895) was Mk IIb Z3687. After serving with 17, 123, 132 (twice), 331, 43 and 245 squadrons, the aircraft was donated to the Royal Aircraft Establishment. It then began a new career testing the Armstrong Whitworth laminar-flow wing. Painted all white and highly polished with even the roundels removed, the aircraft was used to investigate the airflow behaviour over these types of wings.

Testing continued throughout 1944 and 1945, but it remained on RAE charge and was used as a hack until at least 1948. The exact date when the aircraft was finally grounded is unknown, but it was officially struck off charge (SOC) on 9 April 1951, by which time it was residing at 22 MU (Maintenance Unit), Silloth. It was here that several major components were removed to help keep its cousin Mk IIc LF363 flying, which was operating from Waterbeach at the time, and today still serves the RAF with the BBMF.

The Mk IIc

Increasing the firepower of the Hurricane was always on the agenda. Despite designing aircraft such as the Mk IIb, the rifle calibre .303in machine guns did not have the punch to knock down a heavily armoured enemy aircraft quickly. The solution was a cannon, and the first example, which used a 20mm Oerlikon cannon, was trialled

The Hurricane Mk IIc marked the pinnacle of the development of the breed and was by far the most numerous of all the marks built, at 4,711. Entering RAF service from April 1941, the 20mm cannon gave the Hurricane the extra punch it had needed for so long. (Via author)

© Osprey Publishing • www.ospreypublishing.com

The prototype Mk IId Z2326, which was originally built as a Mk IIa. First flown in its new guise in September 1941, the Hurricane is pictured during its extensive trials with the A&AEE from Boscombe Down during early 1942. Note that the Vickers 40mm cannons are being used without cowlings. (Via author)

successfully during the Battle of Britain. Following the introduction of all metal outer-wings, the carriage of heavier weapons was now possible. The .303in machine guns were removed and replaced by four 20mm Hispano cannon (two in each wing) with up to 364 rounds of ammunition. This transformed the Hurricane into a formidable ground-attack aircraft and one that could tackle enemy aircraft effectively, especially during intruder operations, both during the day and the night.

The stronger wing could also carry a pair of 250lb bombs, which increased to two 500lb bombs or the ability to carry a pair of long-range fuel tanks. The Hurricane was now evolving into a dedicated ground-attack aircraft, often referred to as the 'Hurribomber'. The first Mk IIcs were delivered to 3 Squadron at Martlesham Heath from April 1941 before moving to Hunsdon, via Stapleford Tawney, in August. Painted all black, the Mk IIc quickly became a night intruder specialist in the hands of 1, 3, 87, 247 and 257 squadrons in the skies over Northern France and the Low Countries. 1 Squadron in particular, operating from Tangmere, built an excellent record thanks to a pair of expert night-fighting tacticians, Sqn Ldr J. MacLachlan and Flt Lt 'Kut' Kuttelwascher.

Offensive operations were carried out by the Mk IIc into 1942, and 3, 43, 87 and 245 squadrons all took part in the historic raid on Dieppe on 19 August 1942. The mark remained in front line service with 309 Squadron in the defence of Scotland, until finally being replaced by the Mustang in October 1944.

The Sea Hurricane Mk IIc

By far the best of the naval breed, the Sea Hurricane Mk IIc was furnished with the standard catapult spools, arrestor hook and naval radio equipment. Taking full advantage of the Merlin XX engine, this variant was very popular with the FAA's pilots, and by early 1944 over 400 had been converted.

The Mk IId

The Hurricane's increasing success as a ground-attack aircraft made Hawker look at expanding the types of armament the aircraft could carry. The latest variant was prompted by an operational need for an aircraft capable of attacking enemy tanks and soft-skinned vehicles, especially in the North African desert. On the ground, German armour had a distinct advantage

© Osprey Publishing • www.ospreypublishing.com

against all Allied tanks during this period, but the tide could be turned if a very large calibre weapon could be used from above.

The Mk IId was designed to fill this role, fitted with a pair of Vickers Type 'S' 40mm cannon carried inside a pair of pods under each wing, while one and sometimes a pair of .303in machine guns were retained for sighting. The prototype, ex Mk IIa Z2326, was first flown in its new form in September 1941. The Mk IId 'tank-busters' first entered service with 6 Squadron in April 1942 at Bu Amud, near Tobruk, a unit that was appropriately nicknamed the 'Flying Tin-Openers'. The type went into action for the first time with 6 Squadron from 6 June 1942 and enjoyed great success against General Rommel's armour until it was replaced in July 1943.

The Mk IId was a rare machine in Britain, only serving with 164 and 184 squadrons, but was more prolific in North Africa and in the Far East, being particularly useful in Burma.

The Mk IIe

Following more wing modifications, the proposed Mk IIe contained so many modifications that it was rebranded as the Mk IV, and the Mk II series was finally brought to a close.

Hurricane Mk II	
Power	Hurricane and Sea Hurricane Mk IIc: One Rolls-Royce Merlin XX 12-cylinder 60 degree Vee liquid-cooled engine rated at 1,280hp at take-off and 1,850hp at 21,000ft
Dimensions	Span 40ft Length 32ft 2in Height 13ft 2in (Watts propeller, blades vertical) Wing Area 258sq ft
Weights	Mk IIb (Temperate): Tare 5,467lb; Normal Loaded 7,233lb Mk IIb (Tropical): Tare 5,594lb; Normal Loaded 7,396lb Mk IIc (Temperate): Tare 5,658lb; Normal Loaded 7,544lb Mk IIc (Tropical): Tare 5,785lb; Normal Loaded 7,707lb Sea Hurricane Mk IIc: Tare 5,738lb; Normal Loaded 7,618lb Mk IId (Tropical): Tare 5,550lb; Normal Loaded 7,850lb
Performance	Mk IIc: Max Speed 339mph at 22,000ft Climb Rate 20,000ft in 9min 6sec Range 460 miles or 970 miles with auxiliary tanks Service Ceiling 32,400ft
Armament	Mk II and Mk IIa: Eight .303in machine guns Mk IIb: 12 .303in machine-guns and two 250 or two 500lb bombs Mk IIc: Four 20mm Hispano cannon in the wings and provision to carry up to two 500lb bombs Mk IId: Two Vickers Type 'S' 40mm cannon and one .303in machine gun
Production	Mk IIa: 451; Mk IIb: 2,829; Mk IIc: 4,711; Mk IId: 296. f/f P3269, 11 June 1940
Serial prefixes	Mk IIa: Z Mk IIb: Z, AP, BD, BG, BM, BP, BW, HL, HV, KW, KX, KZ, LB, LD and LE Mk IIc: Z, BD, BE, BM, BN, BP, HL, HV, KW, KX, KZ, LB, LD, LE, LF, MW, PG and PZ

Hurricane Mk III

The Mk III was designed as a contingency plan, in the event that the supply of Rolls-Royce Merlin engines could not match the demand. The aircraft was designed to accept the US-built Packard Merlin engine, but by the time

© Osprey Publishing • www.ospreypublishing.com

A good example of a Mk IV is KZ320, which entered service with 42 Squadron before heading overseas to 1 Service Flying Training School (India). As robust as the Hurricane was, this was SOC after a mid-air collision with a Vulture in April 1945. (Via author)

production was to have begun, the British-built engine was readily available. The engine was, however, later used for the 1,451 Mk X, XI and XIIs built in Canada.

Hurricane Mk IV

Despite the last Hurricanes to leave the production line being Mk IIcs, the final production variant was the Mk IV. The mark showed how the aircraft had evolved from its pure fighter roots into an aircraft now fully equipped for the ground attack role.

The modified 'universal wing', planned for the Mk IIe, once again allowed the Hurricane to carry a greater range of stores. These included the same 40mm cannon fitted to the Mk IId, RPs, 250 and 500lb bombs and long-range fuel tanks. Protective armour was also increased, 350lbs being placed around the cockpit, radiator, fuel tanks and around the engine. The latter was a 1,620hp Merlin 24 or 27 fitted with a Vokes filter.

The Mk IV served with 26 operational RAF squadrons, the first aircraft arriving in strength from the spring of 1943 onwards. The majority served in Tunisia and northwards through Italy, and in the Far East, where the Mk IV carried out fighter escort duties, photographic and fighter reconnaissance as well as general ground attack operations. The latter in particular saw the combined efforts of Mk IIds and Mk IVs decimate Japanese armour, ground transport and river craft during the final assault on Rangoon.

6 Squadron received the Mk IV from July 1943, and after remaining in Italy until the war's end, the squadron took their ground attack fighters to Palestine where, in February 1946, some of the longest serving Hurricanes were finally retired in favour of the Spitfire.

Hurricane Mk IV	
Power	One 1,620hp (1208kW) Merlin 24 or 27 12-cylinder engine
Dimensions	As per Mk IId
Weights	Tare 6,150lb; Normal Loaded 8,462lb
Performance	As per Mk IId; 284mph at 13,500ft with eight 60lb RP and 350lbs of armour
Armament	Two Vickers Type 'S' 40mm guns and two 0.303in Browning guns in the wings. Eight 60lb RPs or a pair of 250 or 500lb bombs
Production	580; f/f KX405, 14 March 1943.
Serial prefixes	HL, HM, HV, HW, KW, KX, KZ, LB, LD, LF, PG and PZ

© Osprey Publishing • www.ospreypublishing.com

Hurricane Mk V

The Mk V was an attempt to stretch the ground-attack capability of the Hurricane one stage further. The Mk V was powered by a Merlin 32 engine, driving a Rotol four-blade propeller. Only three Mk Vs were ever built (in 1943), and two of these were Mk IV conversions with the intention of producing an 'optimised' Hurricane specifically for operations in the Far East.

The Mk V, despite having an all-up weight of 9,300lb, was still capable of flying at 326mph at 500ft, but general performance was not significantly improved. In the end, the Air Ministry decided that the large stocks of Hurricanes already available in India would suffice and the Mk V was never developed beyond the prototypes.

Hurricane Mk V	
Power	One 1,645hp (1,230kW) Merlin 32 12-cylinder engine
Dimensions	As per Mk IId
Weights	All-up 9,300lb
Performance	Maximum speed of 326mph at 500ft
Armament	Two Vickers 'S' 40mm guns and two 0.303in Browning guns in the wings. Eight 60lb RPs or a pair of 250 or 500lb bombs
Production	3
Serial prefixes	KX405, KZ193 and NL255

Philip Lucas puts Hurricane Mk V KZ193 through its paces for the benefit of renowned aviation photographer Charles E. Brown. The Hurricane, which was originally built as a Mk IV, was one of two temporarily converted to Mk V standard. (Charles E. Brown via author)

Photographic Reconnaissance

PR Mk I

This mark was an unarmed reconnaissance conversion with extra fuel tanks placed in the gun bays. Only three aircraft were converted; two were fitted with a pair of 8in F.24 cameras, while the third carried a fan of three 14in F.24 cameras. All three were converted from the Mk IIa Series II.

PR Mk II and IIa

Converted from the Mk IIa Series 2, the vast majority of them were tropicalised.

PR Mk IIb PR MK IIc

These were converted from the Hurricane Mk IIb and Mk IIc.

Tac R Mk I and Tac R Mk II (FE)

Eight Mk Is were converted by 103 MU, Aboukir for tactical reconnaissance duties by fitting a single vertical-mounted F.24 camera. Several repaired Mk IIas and Mk IIbs were also converted by 103 MU during 1941 and redesignated as Tac R Mk IIs. Modified Mk IIcs serving in the Far East were designated as Tac R Mk II (FE). Armament on all Tac Rs varied from nothing at all to the fitment of two or four .303in Browning machine guns or 20mm Hispano cannon.

© Osprey Publishing • www.ospreypublishing.com

A Canadian Car and Foundry Company Mk XII, No.5388, taxis at Rockliffe for its maiden flight in early 1942. The fighter went on to serve with 133 (F) Squadron for just eight days until a category 'C' accident, and then after repair flew with Canadian Pacific Airlines. (Via author)

Made in Canada

As early as 1937, senior staff of the RCAF had been trying to acquire Hurricanes but had faced objections from the Air Ministry, which was uncertain at the time whether the RAF would have a sufficient amount of aircraft, let alone other air forces. Political manoeuvring and continuous pressure from Canada, especially at the time of the Munich Crisis in 1938, saw the British government come round to the idea of equipping Commonwealth squadrons with Hurricanes that could fly in support of the RAF in the event of a war.

By October 1938, the first five of 20 allocated Hurricane Mk Is had been diverted from the Kingston production line for shipment to Canada. At the same time, a further agreement to produce the fighter in Canada had been achieved, with production to be undertaken by the Canadian Car and Foundry Company in Montreal. On 2 March 1939 a single pattern Hurricane was also shipped to Canada, and in a very short period of time production lines were set up, thanks to efforts on both sides of the Atlantic. By 1940, the first of 1,451 Canadian-built Hurricanes left the production line at Montreal.

Mk I

The first 40 Hurricanes built by the Canadians were standard Mk Is powered by a Merlin III engine and fitted with a de Havilland propeller.

Mk X

The Mk X was fitted with a 1,390hp Packard-Merlin 28. One hundred were produced with an eight-gun wing while the remainder were fitted with the Mk IIb wing. A large quantity was later converted to the Mk IIc wing and, of those subsequently shipped to Britain, all were modified to Mk IIb and Mk IIc standard. During 1940 and 1941 489 Mk Xs were built.

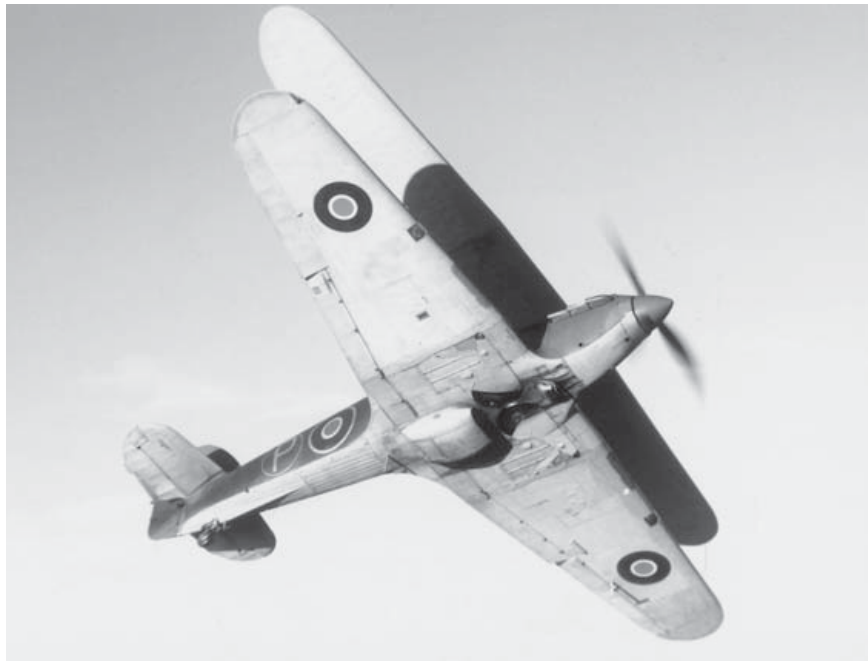
D

ARMAMENT

1. The standard Mk I eight-gun arrangement of eight .303in Browning machine guns.
2. The Mk IIc Hispano-Suiza HS 404 20mm cannon with a muzzle velocity of 2,790ft/s.
3. The Vickers Type 'S' 40mm anti-tank guns as fitted to the Mk IId and the Mk IV. Conceived in the late 1930s, the 'S' was originally intended as a bomber defence weapon.
4. Anti-tank Rolls-Royce BF (belt-fed) 40mm gun, which was developed at the same time as the Vickers but not selected because of its bulkiness and inability to carry more than 12 rounds per gun.
5. 25lb and 60lb Rocket Projectiles (RPs) could be carried by the Hurricane. The warhead was attached to a standard 3in rocket in batches of eight, four under each wing.
6. From the Mk IIb onwards, the Hurricane was given the capability to carry a pair of 250lb or 500lb GP bombs.

© Osprey Publishing • www.ospreypublishing.com

© Osprey Publishing • www.ospreypublishing.com



A well-travelled Hurricane was ex-RAF L1884, which was originally taken on charge by the RCAF on 22 May 1939 only to be returned to Britain in May 1940. Modified by F. Hill and Sons Ltd, the fighter flew as the 'slip-wing' for over three years before being retired in early 1944. (Via author)

Mk XI and Mk XIb

These marks were fitted with 12-gun (XI) or four-cannon armament (XIb). The majority of the 150 aircraft built were shipped to the Soviet Union.

Mk XII

The Mk XII introduced the 1,300hp Packard-Merlin 29 engine and Mk IIc modifications. Armament was as for the Mk XI. Two hundred and forty-eight aircraft were built.

Sea Hurricane Mk XIIa

This was as per the Mk XII, but fitted with an eight-gun wing, catapult spools and arrestor hook.

Ski Landing Gear

Quite a few Hurricane Mk Xs were fitted with fixed skis to replace the main landing gear and a 'snow-shoe' tailskid. All original undercarriage gear was removed and the aperture faired over. These Hurricanes were powered by a Packard-Merlin 28 and fitted with a Hamilton Standard propeller. The aircraft only served with the RCAF from 1941 to 1943.

The Two-seaters

A two-seater Hurricane would have been a valuable asset to the RAF prior to the beginning of World War II. However, it was not to be, and only three air forces – the Persian, the Russian, and surprisingly the USAAF – benefitted from two seat conversions.

Ten Hurricanes were converted as trainers for the Russian Air Force, with a second cockpit and dual controls to help pilots convert to the hundreds of machines of the type that were flooding into the country. These hard working machines also served as glider tugs for A-7 and G-11 gliders and several

© Osprey Publishing • www.ospreypublishing.com

operations were carried out. One aircraft, BW945, doubled as an artillery spotter machine with a single machine gun mounted in the rear cockpit.

Three aircraft that were being used as target-tugs for the USAAF's 350th Fighter Group in Sardinia during 1944, including LB460, were also converted into two seaters. The conversion was actually enclosed by skilfully using a second sliding canopy that mated with the original.

Two trainers for the Persian Air Force first flew with two open cockpits in 1946, but before delivery the rear cockpit was enclosed with a Tempest hood. The first of these, ex-Hurricane Mk IIc KZ232, was first flown from Langley on 27 September 1946 and by early 1947 both aircraft, now designated T Mk IIc 2-31 and 2-32, were serving with the Persian Air Force.

The Proposals

F.37/35 Four-Cannon Design

A proposal was tendered on 23 April 1936 based on the prototype but fitted with four Oerlikon 20mm cannons. It was rejected in favour of the Westland Whirlwind.

Two-Cannon Hurricane

This evolved from a trial installation of a pair of 20mm Oerlikon cannon mounted under the wings and additional cockpit armour during service trials performed in 1939. One aircraft successfully served with 151 Squadron during the Battle of Britain in 1940.

Yugoslav Daimler-Benz Hurricane

This was a Hurricane that was planned to be produced with a DB601A and built in Yugoslavia. Only one aircraft was completed under licence before the German invasion in April 1941.

Eleven Hurricanes of 'Treble One' with their engines running are about to taxi out to begin the day's flying demonstration for the press at Northolt in 1938. Worthy of note here is the unique way that '111' has been unofficially painted on the rear fuselage in at least three different ways. Gillan is also visible in the fourth aircraft along, L1555, which is complete with squadron leader's flash below the cockpit. (*Aeroplane* via author)

© Osprey Publishing • www.ospreypublishing.com

Dagger Hurricane
This was a proposal to ease pressure on Merlin production by suggesting the fitment of a Napier Dagger engine. It was studied in detail during the Battle of Britain period but shelved by November 1940.

Griffon Hurricane
One version of the proposed F.37/35 was to be powered by the Griffon IIa during 1939–41. When the Typhoon entered production, the concept was dropped.

Hercules Hurricane
Another alternative powerplant for the fighter was the Hercules, proposed in 1941. The concept suggested that all second line Hurricanes could be fitted with the more prolific unit to ease production of the Merlin.

Hurricane (side-blister) Canopy
This was not put into mainstream production, but at least one aircraft was flown by 145 Squadron in this guise during mid-1940.

Hurricane (Improved Canopy) Project
This modified the lower rear fuselage with a one-piece canopy to help improve field of vision. One prototype was built but all trials had ceased by March 1942.

OPERATIONAL HISTORY

111 Squadron Leads the Way

The honour of receiving the RAF's first monoplane fighter was bestowed upon 111 Squadron under the command of Sqn Ldr J. W. Gillan in December 1937. The official 'start date' for re-equipping from their Gauntlets was 1 January 1938, but four Hurricanes, L1548 to L1551, had already arrived at Northolt, Middlesex, by Christmas Day 1937. By the end of February, the full squadron establishment of 16 aircraft had arrived, making up two flights of six and four in reserve.

The task now facing the pilots of 111 Squadron was converting from the 230mph Gauntlet, with its open cockpit and fixed undercarriage, to the 330mph Hurricane, with its enclosed cockpit, flaps and retractable undercarriage.

Record-Breaking Flight

Sqn Ldr Gillan was well aware that his pilots needed a confidence booster, especially since the death of one of them in a flying accident, even though it was through no fault of the aircraft. Gillan started planning a high-speed flight between Northolt and Turnhouse (near Edinburgh) on 10 February 1938. Gillan, flying L1555, set course for Turnhouse in the early afternoon, but after encountering a strong headwind almost all of the way he did not land at the Scottish airfield until 1600hrs. It was obvious to Gillan that the headwind he had encountered en route would benefit him on the return flight to Northolt if he could refuel quickly. Gillan climbed to 17,000ft as dusk began to descend

© Osprey Publishing • www.ospreypublishing.com

Reformed at Debden from 'A' Flight of 87 Squadron, 85 Squadron received its first Hurricanes in September 1938. After making a valuable contribution to the battle of France and the Battle of Britain, the unit was re-equipped with Defiants in a night fighter role from January 1941. Mk I P3408 was one of its first Hurricanes. (Via author)

and set course for Northolt above heavy clouds without the aid of oxygen. A break in the clouds revealed the twinkling lights of Bedford below, so Gillan began a shallow descent through the gap. He arrived over Northolt alarmed by the fact that his ground speed was well over 450mph. Gillan taxied across Northolt's grass having covered the 327 miles from Turnhouse in just 48 minutes and at an average speed of 408.75mph. The flight had also been flown at full throttle and the Rolls-Royce Merlin engine never flickered during the entire flight.

Once the national and world press got hold of the story, the pilots of 111 Squadron were elevated to the RAF elite. The Air Ministry kept quiet about the 80mph tailwind of which Gillan had taken advantage, which warranted him the service nickname of 'Downwind Gillan'. His aim on this flight was simply to instil more confidence in his young pilots. There is no doubt that he achieved this in style, as 'Treble One' (111 Squadron) would never be the same again. Gillan's approach to training his pilots and his leadership by example was later recognised with the award of the AFC.

More Squadrons Follow

The next unit to receive the Hurricane was 3 Squadron, under the command of Sqn Ldr H. L. P. Lester. Having operated the Bulldog through most of the 1930s and then briefly the Gladiator, the first Hurricanes began to arrive at 3 Squadron's base in Kenley, Surrey from March 1938. Kenley was not a large airfield, and the Hurricane needed a lot more room than the biplanes that preceded it. A spate of accidents occurred as pilots struggled to keep the modern fighter within the airfield boundary. The problem came to a head in May, when two Hurricanes were written off and Plt Off H. Henry-May was killed as L1579 stalled on approach and dived into the ground.

A quick decision was made to re-equip 3 Squadron with the Gladiator while Kenley was expanded to cope with the new fighter. The Hurricane did not return to 3 Squadron until July 1939, by which time the unit had moved to nearby Biggin Hill.

The third Hurricane unit was 56 Squadron, based at North Weald under the command of Sqn Ldr C. L. Lea-Cox. 56 Squadron had also been operating

© Osprey Publishing • www.ospreypublishing.com

Seven 73 Squadron Hurricane Mk Is in loose formation over France in September 1939. The squadron arrived in France on 9 September and was the last RAF squadron to leave on 16 June 1940. (Via author)

the Gladiator before the first Hurricanes were delivered during May and June 1938. From 1 April, squadron strength rose to 20 or 21 aircraft, which was broken down into two flights of nine aircraft each, with the remaining two or sometimes three machines being used for conversion training. The transition to the modern fighter was carried out with few problems and, by August, 56 Squadron was declared operational with the Hurricane; it was only the third so far.

By the time of the Munich Crisis in September 1938, Fighter Command planned to have at least a dozen squadrons of Hurricanes and Spitfires operational. In reality, 56 and 111 Squadron were the only Hurricane units that could be brought to readiness, while Spitfires were arriving with 19 Squadron alone, and at a slow rate. The latter continued to be delivered slowly through the remainder of 1938, but the pace of Hurricane delivery began to accelerate. By October, the rate of production of the Hurricane was high enough to re-equip one squadron per month and replace any losses incurred by units already receiving the type.

The next Hurricane squadrons to be formed were both based at Debden in Essex. First was 87 Squadron under the command of Sqn Ldr J. Rhys-Jones, which saw its Gladiators replaced from July 1938 onwards. The transition period from biplane to monoplane would have been quicker if 87 Squadron had not been ordered to donate its 'A' Flight as a nucleus for the second unit at Debden to receive the Hurricane, 85 Squadron. Re-formed on 1 June, 85 Squadron used the Gladiator for a few months before the first Hurricanes began to arrive from September. It was not until November that 85 Squadron was officially recognised as an operational unit, now under the command of Sqn Ldr D. F. W. Atcherley.

73 Squadron, under the command of Sqn Ldr E. S. Finch and based at Digby in Lincolnshire, was the next to receive the new fighters from late July 1938. 32 Squadron at Biggin Hill, commanded by Sqn Ldr R. Pyne DFC, followed in September, then it was the turn of three Tangmere-based squadrons. Sqn Ldr I. A. Bertram's 1 Squadron replaced its Gladiators in October, followed by 43 and 79 Squadrons, under the command of Sqn Ldr R. E. Bain and Sqn Ldr G. D. Emms respectively, who received their Hurricanes in November. Before the year was over, the Gauntlets of 151 Squadron, under the command of Sqn Ldr E. M. Donaldson and based at North Weald, were also replaced.

By the end of 1938, five Hurricane squadrons were operational and five more were, literally, waiting in the wings. The Spitfire in contrast had only been delivered to 19 and 66 Squadrons, neither of which was operational.

Deliveries continued apace into 1939, the first unit of the year being Sqn Ldr J. H. Edwardes-Jones' 213 Squadron at Wittering in Northamptonshire, which had been flying the Gauntlet since its re-formation in March 1937. Digby-based 46 Squadron, under the command of Sqn Ldr P. Barwell, received its first Hurricanes in late February 1939. Much to the surprise of the regular air force, let alone the auxiliaries themselves, 501 (County of Gloucester)

© Osprey Publishing • www.ospreypublishing.com

Squadron of the Royal Auxiliary Air Force (RAAF), based at Filton near Bristol and under the charge of Sqn Ldr M. V. M. Clube, received Hurricanes from March to replace its ageing Hinds. A second auxiliary unit, 504 (County of Nottingham) Squadron, under the command of Sqn Ldr Sir H. M. Seely Bt MP, also received Hurricanes at Hucknall from May.

The 'Phoney War'

The first few months of the war in Western Europe were known as the 'Phoney War'. This was a period of calm before the storm as Germany regrouped after the invasion of Poland and Allied commanders braced themselves for the inevitable Blitzkrieg. Nevertheless, the Hurricanes of the RAF took part in operations in mainland Europe.

Just three days after the first German troops crossed the Polish border on 1 September 1939, both Britain and France declared war. In a prearranged agreement with France, Britain quickly established the BEF (British Expeditionary Force), which crossed the Channel and took up positions along the border with Belgium. The RAF contributed two large groups called the Air Component of the BEF and the AASF (Advanced Air Striking Force). Among the many squadrons contained within the Air Component were the Hurricanes of 85 and 87 squadrons, while the AASF contained 1 and 73 squadrons, who were tasked with flying escort operations in support of Blenheim and Battle squadrons and general air defence.

The bombers and army co-operation aircraft sent to France met with approval from the host nation, but the fighter element fell woefully short and the French were very disappointed that no Spitfires had been sent over. This was a veiled way of admitting that France's own fighters were no match for the Luftwaffe's aircraft, in particular the Bf 109. Pressure began to build for at least another six fighter squadrons, but Air Chief Marshal Hugh Dowding, the head of Fighter Command, fervently resisted sending any more of his precious aircraft. However, he did compromise by despatching a pair of auxiliary units, 607 and 615 squadrons, both flying the Gladiator, which arrived in France in November 1939. Dowding also promised to reconsider his decision if the Germans launched a major offensive, if the BEF was left in a perilous position or if, most crucially, Fighter Command's strength reached the commander-in-chief's minimum figure of 52 operational squadrons.

Behind closed doors, Dowding was not keen to send his fighter squadrons to France to operate in an environment where there had been so little enemy air activity. During the first months, Luftwaffe operations had been confined to the odd reconnaissance or low number bombing raid, which very rarely exceeded three aircraft. Unbeknown to the French and the BEF, however, the Luftwaffe was being rested and re-equipped after its Blitzkrieg in Poland.

After initial high hopes of seeing some action, the pilots of 1 Squadron at Vassincourt, 79 Squadron at Rouvres, and 85 and 87 Squadrons at Lille/Seclin found themselves flying the odd patrol and occasional scramble. For the RAF, the main enemy during autumn and the winter of 1939–40 was the weather, since after a large amount of rain and snow it was not long before the badly drained French airfields turned to mud. However, the sturdiness of the Hurricane and its excellent wide-track undercarriage meant that it was very unusual for operations to be disrupted.

With its motto *In Omnibus Princeps* (first in all things), it was appropriate that the first enemy aircraft to be shot down was achieved by 1 Squadron. On

© Osprey Publishing • www.ospreypublishing.com

One of the 11 Hurricane Mk Is that fought against the Soviet air force during the Continuation War that raged from 1941 through to 1944. (Via author)

30 October 1939, Plt Off P. Mould, in L1842, attacked and shot down a Dornier Do 17P over Toul at 18,000ft. L1842 was in action again on 23 November, this time in the hands of Sgt A. V. 'Taffy' Clowes. Clowes was one of three in a section led by Flt Lt G. Plinston when they attacked a lone Heinkel He 111 at 20,000ft between Metz and Verdun. All three pilots attacked the enemy bomber, but it was Clowes who delivered the final, fatal blow. As Clowes pulled away following his final attack, half a dozen French Morane-Saulnier fighters joined the fight to finish off the already stricken Heinkel. In their excitement, one of the French fighters collided with L1842 and removed half of the rudder and one elevator. Clowes managed to maintain control to carry out a forced landing at Vassincourt where the Hurricane was repaired in situ. This is a typical example of the punishment a Hurricane could take and how quickly it could be repaired to fight another day.

In the meantime, 73 Squadron was also quick off the mark when Fg Off E. 'Cobber' Kain claimed the unit's first kill on 2 November. 85 Squadron followed on 21 November when Flt Lt R. Lee in L1898 shot down a He 111 off Boulogne. Before the month was over, 87 Squadron had caught up when Flt Lt R. Jeff destroyed another He 111 near Hazebrouck.

By now, the last of 600 L-series Hurricanes had been delivered, all built at Brooklands. They were to be followed by another batch of 300 aircraft without any disruption to the production line. The first success with the new Hurricane was achieved by 111 Squadron, which was serving at Acklington in Northumberland at the time. Only days before departing to Drem in East Lothian, the commanding officer, Sqn Ldr H. Broadhurst AFC, took off alone after receiving a report that enemy aircraft were approaching the coast. The weather was atrocious but Broadhurst pressed on, flying only on instruments through thick cloud. On clearing his iced up windscreen, he spotted a group of He 111s of KG (Kampfgeschwader) 26 inbound from its base in Schleswig. Broadhurst picked out a single aircraft at a range of 500yds; the bomber dived into cloud but Broadhurst remained focused and continued to close until he was just 150yd from the Heinkel. A quick burst of fire put the ventral gunner out of action, and the second burst sent the Heinkel into a flaming spiral dive into the sea. This was the first of many victories for 111 Squadron, and it seemed appropriate that this popular CO took the victory. Broadhurst was awarded the DFC for his action that day in preferring to risk himself rather than his squadron.

© Osprey Publishing • www.ospreypublishing.com

The Winter War

On 30 November 1939 another conflict broke out in Europe, as Finland refused to give in to Russia's demands to build military bases on its soil. The Russians also called for a repositioning of the Karelian Isthmus border. This would dissolve the effectiveness of the Mannerheim Line, which was Finland's only significant line of defence against its much larger neighbour.

Finland's air force, despite being small, was equipped with modern aircraft. The Finns used these well, inflicting heavy losses on Russia's comparatively obsolete air force. Britain was politically in support of Finland's fight against the Soviets, but was slow to provide any kind of military hardware. However, an order already placed by the Finns for a dozen Hurricanes was brought forward, and the planes were eventually shipped in February 1940. Only 11 actually arrived, however, and by the time they had been assembled the weight of the Russian Army and Air Force had taken its toll on the Finnish Air Force. The Winter War came to an end on 13 March 1940.

The 11 Hurricanes did eventually enter service with the Finnish Air Force and, despite no spares being available, the majority went on to see action in the Continuation War against the Soviets (1941–44). Employed for interception operations, the Hurricanes were very popular with the Finnish pilots, who rated them very highly until they began to be re-equipped with German-built machines. Several Soviet aircraft were shot down during the Continuation War by Hurricanes without loss. Britain did supply the Soviets with rather more Hurricanes later in the war. It would be very interesting to report on a Hurricane versus Hurricane encounter, but sadly no such records exist.

Norway

One Hurricane unit, along with 263 Squadron's Gladiators, contained the only RAF fighters to see action over Norway during May 1940. 46 Squadron, under the command of Sqn Ldr K. B. B. Cross, was embarked via a lighter aboard HMS *Glorious* at Greenock on 10 May. After crossing the North Sea, they took off and landed at Skånland and Bardufoss on 25 May; this was the first time a Hurricane had been flown from a carrier.

It was decided that the Gladiators, which had already been in action, would operate from Skånland and the Hurricanes from Bardufoss. After familiarising themselves with the area around Narvik over the following days, the first encounter with the enemy came on 28 May. Fg Off J. W. Lydall in L1806 and Fg Off P. R. McGregor in L1853 intercepted a Junkers Ju 88 trying to attack the port and shot it down over Tjelbotn. During the evening, 46 Squadron caught a pair of Do 26s preparing to disembark 20 German alpine troops in the Rombaksfjord. Both were shot down, although one managed to carry out a forced landing in which the crew and ten troops were captured.

By 3 June, it was clear that the British could hold Narvik no longer and a withdrawal began, protected from above by the constant patrols of 46 Squadron and their FAA counterparts. By 7 June, the Luftwaffe's position had grown much stronger and raids on Narvik increased. On that day, the pilots of 46 Squadron found themselves defending against three heavy He 111 attacks. That evening, Sqn Ldr Cross was ordered to destroy all remaining Hurricanes and equipment and make for a ship in the harbour. After much negotiation, Cross managed to convince those above him that he should be allowed to fly his remaining ten Hurricanes onto HMS *Glorious*, despite the

© Osprey Publishing • www.ospreypublishing.com

Facilities in France were often lacking, so the luxury of servicing a Hurricane in the comfort of a hangar was a rare thing. The French spring and summer was reasonably kind to the vast number of ground crew who kept the fighters up against a numerically superior enemy. The aircraft is P2829 of 87 Squadron, possibly at Amiens in April 1940. (Via author)

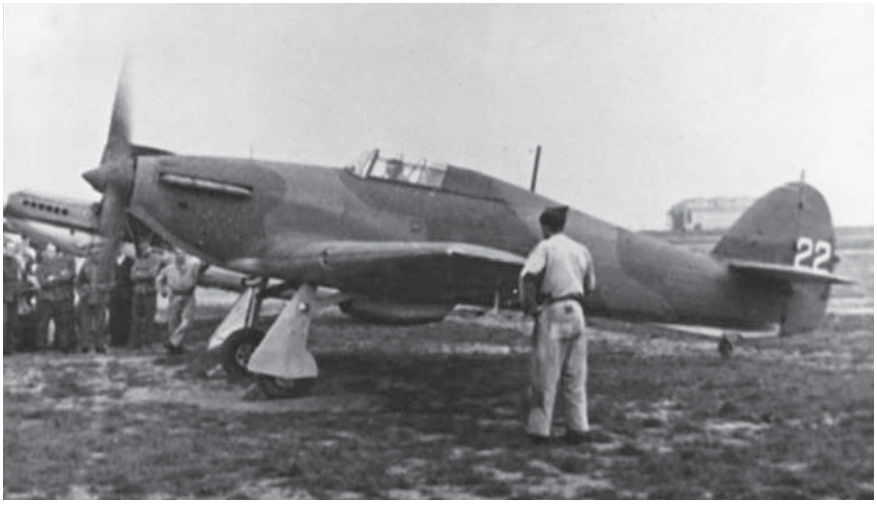
fact that neither he nor any of his pilots had landed on a carrier before. Between 1800hrs on 7 June and 0045hrs on 8 June all ten Hurricanes were landed safely on HMS *Glorious*, while all remaining pilots and ground crew headed for Narvik to board the MV *Arandora Star* and make for home. In an effort to distance herself from the danger of a land-based aerial attack, HMS *Glorious* had inadvertently sailed within range of the German battle cruisers *Scharnhorst* and *Gneisenau*. Despite the valiant efforts of her two supporting destroyers, HMS *Glorious* succumbed to enemy fire and sank at 1740hrs, within 20 minutes of the order to abandon ship being given. Only 40 men survived the sinking, including 46 Squadron's CO, Sqn Ldr Cross, and one pilot, Flt Lt P. G. Jameson; 1,515 seamen and airmen perished.

The Battle of France

On 10 May 1940 the German Army began to push west, beginning with the Netherlands, Belgium, Luxembourg and on into France. The German plan was simple; they would attack north of the Maginot Line and push through to the English Channel, which would leave the BEF separated from the French Army. A final push south towards Paris would bring about a swift end to the operation.

By this time some of the Hurricane squadrons in France had relocated, including 1 Squadron, which moved from Vassincourt to Berry-au-Bac on the day of the German mobilisation. 73 Squadron moved to Reims/Champagne and 85 Squadron remained at Lille/Seclin while 87 Squadron moved to Senon. 607 Squadron at Vitry-en-Artois and 615 Squadron at Abbeville were still flying Gladiators, but by now were in the process of re-equipping with Hurricanes. These six squadrons had a total strength of 96 Hurricanes. As news of the unfolding events reached London, Dowding, as promised, sent three more Hurricane units – 3, 79 and 504 squadrons – to France to bolster the Air Component and 501 Squadron to reinforce the AASF.

© Osprey Publishing • www.ospreypublishing.com



The Hurricanes of the Belgian Air Force were the first foreign machines to see action in March 1940 against a formation of Bf 110s, of which three enemy machines were shot down. Only 15 served with the Group I/2 La Chardon (The Thistle) from Schaffen, and by early May 1940 virtually all had been destroyed following a heavy bombing raid. (Via author)

The ten Hurricane squadrons fought hard from the outset. 501 Squadron, which had lost three pilots killed and six more injured when its transport aircraft crashed at Betheniville, still managed to claim 18 enemy aircraft destroyed in the first two days of the fighting, at the expense of two pilots and three aircraft. 87 Squadron was briefly excused escort duty on 11 May to attack two large formations of Ju 87s over Brussels and Tongres. By the end of the engagement, ten enemy aircraft had been shot down for the loss of two pilots and their aircraft. Other early successes included 3 Squadron, which shot down eight enemy aircraft without loss on 12 May.

The Air Component units had suffered the brunt of the losses, in particular 85 and 87 squadrons. 85 Squadron shot down 29 German aircraft during the first nine days of the enemy attack. The squadron had lost six aircraft and their pilots, while no reinforcements made it to the home airfield at Merville, where the unit had remained throughout this period. A brief attempt was made to fly 85 and 87 squadrons as a combined unit, the latter also suffering high losses, but instead both were ordered to return to England. 85 Squadron left on 22 May and 87 Squadron on 24 May.

Dowding was by now under even more pressure to send extra fighters to the aid of France. However, once he explained that a third of his home defence strength had already been expended, the pressure eased from his side of the Channel. It was now time to help the BEF to leave France; this exercise would cost Dowding further valuable pilots and their machines.

Dunkirk

Preparations for the evacuation of the BEF, under the code name Operation *Dynamo*, had been in the planning since 19 May. The commander of the Air Component had already withdrawn across the Channel with his HQ to Hawkinge, where AVM C. H. B. Blount worked closely with 11 Group's AOC, AVM K. Park, to organise fighter cover over the beaches.

On 26 May the evacuation began, by which time all RAF squadrons had been withdrawn from the Pas-de-Calais. The Hurricane squadrons, on average, only managed to come back with half their original strength, and at Merville alone approximately 20 fighters were left to burn. Both 607 and 615 squadrons' Hurricanes were transferred to fully operational units and they

© Osprey Publishing • www.ospreypublishing.com

returned to England with the majority of their original Gladiators. 213 and 601 squadrons, who had both sent detachments to Merville on 17 May, also managed to return to England with their original strength.

All fighter operations over France were now controlled by 11 Group, which could also call up several Spitfire and Defiant squadrons in support of *Dynamo*. The Hurricanes were in action from 20 May, when all Kent-based squadrons were instructed to attack German columns on the Cambrai–Arras road. To keep the pressure on, the aircraft were quickly turned around on any French airfield that had not already been overrun.

The BEF's impression, however, was that the RAF had virtually abandoned them. Despite this, German commanders were reporting that the British fighter pilots had achieved air superiority over the Pas-de-Calais for the first time since 10 May.

On the first day of full Dunkirk operations, AVM Park wisely only employed one squadron of fighters over the beachhead at any one time while he worked out how the Luftwaffe tactics would evolve. One Hurricane and

E

'COBBER' KAIN'S FIRST KILL

On the declaration of war, 73 Squadron moved to Le Havre/Octeville on 9 September 1939, and by the following day, New Zealander Fg Off Edgar James 'Cobber' Kain had flown his first operational patrol over northern France. 73 Squadron was one of the first units to see combat with the Luftwaffe since in the early stages of the war pilots were mainly confined to small skirmishes with the odd aircraft.

Earlier in the morning of 8 November, several Do 17P reconnaissance aircraft had been making probing flights into the area. Of the nine Hurricanes despatched to investigate, none had made contact with the enemy, but they remained on patrol in the hope that they would return. Luckily for Kain, in his Hurricane Mk I 'P' *Paddy III*, they did. As he climbed through 18,000ft, he spotted a lone Do 17P of 1.(F)/123 being flown over Metz. Kain opened the throttle to try and catch the Dornier, which spotted the Hurricane at the same time and began climbing as quickly as it could to escape.

At 27,000ft, Kain caught up with his quarry enough to fire three five-second bursts at the Dornier from between 200 and 400yds below its tail. A plume of white smoke, which may have been fuel vapour, trickled from the region of the port BMW engine, at which point Kain thought that the propeller might have stopped turning. Kain stood off in order to give the Dornier the opportunity to land intact behind British lines, but the pilot, Obfw Stühler, had other ideas, making for a cloud in an effort to escape. Kain responded by climbing above the enemy machine and opening fire from 250yds, continuing to do so until he was within 50yds of the Dornier. The rear gunner briefly replied but halted as the Dornier entered a steep turn to port into the now dead engine, before beginning a tight spiral dive at 24,000ft followed by an inescapable vertical dive.

Kain followed the Dornier down until his air speed indicator read 450mph and the fabric began to detach itself from the Hurricane's wings. Kain pulled out of his dive, watching the stricken Dornier continue to accelerate before hitting the ground at 500mph at Luby, eight miles south-west of Sizun, not far from 73 Squadron's home airfield. The Dornier exploded on impact, killing the crew instantly.

The original plan following the German attack was to move the Hurricane squadrons forward on to Belgian soil, but the advance was so swift that all remained in France. The first three days of fighting saw high Hurricane casualties, although not as high as anticipated, with seven pilots killed and 12 aircraft lost. On 13 May, Dowding released a further 32 Hurricanes to help speed the conversion process of 607 and 615 squadrons and to replace losses incurred by other units. By 14 May, attacks on British airfields began to increase and it now became imperative that squadrons kept moving from field to field, not only to avoid destruction from the air but also being overrun by advancing troops. Frustratingly, it was the latter that cost more aircraft, as ground crew were not given enough time to repair battle-damaged Hurricanes. The sight of damaged Hurricanes being burned by their own ground crew as they hastily headed west to escape the advancing enemy became all too commonplace.

© Osprey Publishing • www.ospreypublishing.com

© Osprey Publishing • www.ospreypublishing.com

Spitfire squadron was held at full readiness during daylight hours as well. In contrast, the Luftwaffe could call upon 220 bombers, 60 Bf 110s and a *Gruppe* of Bf 109Es. Within 48 hours, these numbers were raised by a further 120 Ju 87s and almost as many Bf 109s.

From 29 May, AVM Park increased the amount of patrolling fighter squadrons to four in an effort to improve the odds, which had at one point been as high as ten to one in favour of the Luftwaffe. 111 Squadron joined the fight from this day, which ended with another 22 enemy aircraft shot down (15 of these claimed by 264 Squadron's Defiants). Four more Hurricanes were lost and several limped back to Kent with battle damage.

By 30 May, poor weather had helped the evacuation to recover 140,000 men, and the momentum continued through the following day as the Ju 87s remained grounded due to bad conditions. However, 1 June was a different story, as a large formation of Ju 87s managed to reach the beachhead between RAF patrols to sink three destroyers filled with troops. The air war continued through 2/3 June, by which time the evacuation went on mainly during darkness to keep the casualties to a minimum. The last major enemy bomber raid during *Dynamo* took place on 2 June, when 120 German bombers encountered five Hurricane and Spitfire squadrons over Dunkirk. The RAF pilots not only managed to shoot several of them down, but also prevented them from bombing ships in the port still loading troops. Smaller raids by Ju 87s and Ju 88s still managed to slip through the RAF fighter screen, but by 3/4 June the last of 328,226 British and French troops had been evacuated.

During the nine days of Operation *Dynamo*, the RAF had suffered heavy losses, with 84 pilots missing or killed and 135 Hurricanes, Spitfires, Blenheims and Defiants lost. But this was not the end for the Hurricane and Battle pilots of the AASF, which had been split from the main BEF and was now withdrawing westwards across France. While a few Hurricanes continued to provide air cover for the retreating Allied troops, they were bolstered by 17 and 242 squadrons, which were sent to Le Mans from 8 to 16 June before withdrawing to Jersey and Guernsey.

The final Hurricane units to leave France were 1, 73 and 501 squadrons. 1 Squadron was evacuated via St Nazaire on 18 June, while 73 Squadron, whose remaining aircraft were burned at Nantes, left France via St Malo on 17 June. 501 Squadron, whose last role was to cover the evacuation troops from Cherbourg on 19 June, returned with eight Hurricanes to England via Jersey the following day.

The battle of France was now over, and Britain braced itself for the next onslaught. The campaign had cost the RAF 949 aircraft: 477 of these were fighters and 386 of them were Hurricanes, which had taken on the majority of the aerial fighting.

Malta – The Beginning

The Hurricane began a long and crucial association with the isolated yet strategically important island of Malta from early August 1940. The responsibility for the defence of the island fell upon the shoulders of 261 Squadron under the command of Sqn Ldr D. W. Balden. The squadron was formed from two components, the first being the Fighter Flight, already established on Malta with the Sea Gladiator, and the second being 418 Flight, which was originally formed at Abbotsinch with a dozen Hurricanes. The latter embarked on HMS *Argus*, bound for the Mediterranean, and then flew

© Osprey Publishing • www.ospreypublishing.com

from the carrier on 2 August to relieve the hard-pressed Gladiators and a few Hurricanes that had already arrived at Malta from Britain, via France and North Africa. That same day, the two flights were amalgamated at Luqa to become 261 Squadron.

Initially, the attacking Italian Air Force (Corpo Aereo Italiano) confidently despatched unescorted SM.79 bombers, but once the Gladiators began shooting them down they were withdrawn and replaced by fighter sweeps in an attempt to wipe out the RAF defenders. By now, however, the first Hurricanes to operate in the Mediterranean theatre had found their feet, and it was not long before they were making their mark against the Italians and the Luftwaffe.

The aerial bombardment eased until November 1940, but then the Axis embarked upon a high-level bombing campaign against Valletta and Luqa, followed by fighter-bomber raids. These were dealt with by positioning the Hurricanes at high level and the squadron's Gladiators at a lower altitude. On 9 January 1941, 12 Macchi 200s carried out a fighter-bomber raid, but only eight of them managed to escape following a mauling by 261 Squadron. The Luftwaffe also began a concentrated campaign during this period, lasting from 16 to 19 January. During this time, 261 Squadron claimed 40 enemy aircraft destroyed, five probables and 12 damaged. During March and April 1941, a further 35 enemy machines were destroyed, four probables and 21 damaged, at the expense of three pilots and seven Hurricanes.

In May 1941, 261 Squadron was disbanded at Ta Kali, its personnel and aircraft transferred to 185 Squadron.

The Battle of Britain

It is a little-known fact that France did not immediately capitulate to German forces following the evacuation at Dunkirk. Crucially, the French held out for another fortnight, giving Dowding valuable time to regroup his forces until all of his fighter squadrons were finally back on English soil by 1 July 1940.

Of the 58 operational squadrons available to Fighter Command that day, 29 of them were flying the Hurricane, of which 347 aircraft were 'combat ready' and a further 115 were unserviceable but likely to be flying again within a few days. To fly the Hurricanes, 527 pilots were available, although not all were classed 'checked out fully on type', making the fighter the most dominant compared to the Spitfire, Blenheim and Defiant squadrons. This dominance was no more evident than in AVM K. Park's strategically vital 11 Group, which was responsible for protecting the south east of England.

High spirits as the pilots of 32 Squadron enjoy the sun at Hawkinge on 31 July 1940. Behind is Mk I P3522 (parachute on tailplane), which survived the battle to be transferred to 213 Squadron. The aircraft was lost on 10 January 1941 when it hit a hill in low cloud at Calbergh Moor, North Yorkshire. (Via author)

Early forays by the Luftwaffe began during early July 1940 and at first were confined to high-level reconnaissance sorties by single aircraft, followed by a few organised Ju 87 attacks on merchant shipping in the Channel. It soon became apparent that these early probing raids were designed to give the

© Osprey Publishing • www.ospreypublishing.com

Hurricane Mk I P3059 and P3208 of 501 (County of Gloucester) Squadron, taking off from Gravesend in early August 1940; both were shot down by Bf 109s over Canterbury on 18 August within five minutes of each other. Plt Off K. N. T. Lee managed to bail out of P3059 but was wounded, while Plt Off J. W. Bland was killed in P3208. (Via author)

Luftwaffe crews experience of 'over-sea' operations, which they had not been trained to do, and to draw out the RAF fighters to engage on needless and often wasteful patrols.

This enemy tactic was confirmed on 7 July when the Hurricanes of 145 Squadron under the command of Sqn Ldr J. R. A. Peel began a standing patrol over a convoy off the Isle of Wight. During that morning, Peel and Plt Off E. Wakeham shot down a Do 17P before handing over the patrol to 43 Squadron, who also shot down a Dornier that ultimately crashed in France. A third Dornier was claimed by Sqn Ldr M. Aitken of 601 Squadron before the day was over. However, in an attempt to catch the RAF out, the Luftwaffe despatched several *Staffels* of Bf 109Es to attack the Hurricanes and Spitfires coming and going from their patrols. 54 and 65 squadrons' Spitfires bore the brunt of this, losing five aircraft between them, while only one Hurricane was lost. Unfortunately, it is believed that Hurricane Mk I P2756, being flown by Sqn Ldr J. D. C. Joslin of 79 Squadron, was set upon by several Spitfires. Joslin managed to bail out of his burning Hurricane over Chilverton Elms, Kent, but did not survive. Three days later, 79 Squadron, which had been in action for two months without a break, was withdrawn from the battle to Turnhouse for a rest.

The biggest dogfight so far to involve the Hurricane took place on 10 July, the first day of the Battle of Britain. Twenty-two Hurricanes from 32, 56 and 111 squadrons, along with eight Spitfires of 74 Squadron, attacked 26 Do 17 and Do 215s, 30 Bf 110s and 20 Bf 109Es over a convoy off the Kent coast. For 111 Squadron, led by Sqn Ldr J. M. Thompson, it was the first time that the line-abreast head-on style of bomber attack was carried out. Unfortunately, Fg Off T. P. K. Higgs collided with a Dornier of 3/Kampfgeschwader 2 during the first attack, and was forced to bail out of his crippled Hurricane Mk I P3671, only to drown in the Channel. By the end of the encounter, two Dorniers, six Bf 110s and a Bf 109 were destroyed, four other bombers were damaged and several fighters were claimed as probables.

Hurricanes were involved in an action on 19 July that tragically exposed the inadequacies of the Defiant as a 'convoy escort' fighter. 264 Squadron,

F

HURRICANE MK I P2923 'VY-R' OF 85 SQUADRON

This Mk I was flown by Fg Off A. G. Lewis from Croydon in June/July 1940 at the height of the Battle of Britain. Lewis survived the war with a final tally of at least 21 victories, while P2923, along with its pilot, Fg Off R. H. A. Lee, went missing over the North Sea on 18 August 1940.

© Osprey Publishing • www.ospreypublishing.com

© Osprey Publishing • www.ospreypublishing.com

Although this scene was staged for the benefit of the press, it is a typical Battle of Britain scene, played out by Plt Off A. G. Lewis DFC of 85 Squadron at Croydon in September 1940. (Via author)

which had been moved south from Turnhouse to replace 79 Squadron, was bounced by ten Bf 109Es, and within the space of a minute, five of the nine Defiants were spiralling down in flames. If it had not been for the arrival and prompt action of 111 Squadron, the remaining four would have joined their colleagues in the sea.

By the end of July, the Luftwaffe had yet to attempt a major bombing raid beyond the extreme southern counties. In terms of victories achieved, it was still the Hurricane, by a whisker, that led the tally board. By 31 July, the Hurricane claims were 87 enemy aircraft compared to the Spitfire's 71, made up of 17 He 111s, 15 Do 17s, 14 Bf 110s, 12 Bf 109s, ten Ju 87s and seven Ju 88s, plus 12 'other aircraft'. On the other side of the coin, the Luftwaffe had claimed 40 Hurricanes shot down, although at least two of these had actually been victims of 'friendly fire'.

The Luftwaffe carried out another large raid on the morning of 13 August, a day when Fighter Command could boast a total of 678 aircraft, 353 of which were Hurricanes. The main success of the day for the Luftwaffe came when an unescorted raid of 74 Dorniers of KG2 bombed the airfield at Eastchurch, but five of their number were still shot down by Hurricanes. One of the victims was claimed by Flt Lt R. L. Smith of 151 Squadron, who was flying the RAF's only experimental Hurricane armed with a pair of 20mm cannon. Smith, flying L1750, opened fire at 300yds; one bomber burst into flames and another was left trailing smoke.

On 16 August, 249 Squadron, along with several Hurricane squadrons, was destined to see a great deal of action. Another 16 bombers, nine dive bombers, eight Bf 110s and 17 Bf 109s were shot down, 19 of these to the guns of Hurricanes. One of the latter actions involved a patrol led by Flt Lt E. J. B. Nicolson in Hurricane Mk I L3576 of 249 Squadron. Nicolson was leading a flight of three Hurricanes when he spotted the beginnings of a bombing raid on Gosport. Just as the three fighters positioned themselves for an attack they were bounced by several Bf 109s, which set Nicolson's aircraft on fire and his wingman Plt Off M. A. King's Hurricane alight as well. Regardless, Nicolson doggedly remained focused on his quarry, a Ju 88, before bailing out with serious burns to his hands and face; King had already

© Osprey Publishing • www.ospreypublishing.com

been forced to bail out. As the two RAF airmen floated down, they came under fire from a group of Local Defence Volunteers (later the Home Guard), who unwittingly thought that the two airmen were Germans. King is believed to have been dead before he hit the ground. Nicolson suffered a shot gun wound to the buttock, in addition to his already serious injuries. Following a lengthy stay in hospital, Nicolson was awarded the Victoria Cross for his determination against the enemy, the only such award to be presented to a pilot of Fighter Command.

Poor weather on 27 August gave some respite to aircrew on both sides of the Channel, but approximately 100 Dorniers of Luftflotte 2 set course up the Thames Estuary the following day. It looked as if the large enemy formation was about to attack the airfields at Hornchurch and North Weald, but instead it split into two to bomb Rochford and Eastchurch instead. As the Hurricanes of 56 Squadron from North Weald tore into the enemy bombers, a large wave of Bf 109s joined the fray; they were initially tackled by the Spitfires of 603 Squadron from Hornchurch. After another frantic battle nine enemy aircraft had been shot down, but 603 Squadron lost four of its aircraft and 56 Squadron lost three, although for the latter unit two pilots turned out to be safe and one was wounded. It had been a light day for Hurricane losses, with just four machines lost, while the Luftwaffe lost a total of 28 by the day's end.

As the fighter versus fighter loss rate continued to remain static, AVM Park was ordering his controllers by 30 August not to expose his forces in free chasing combats with the Bf 109s. The Hurricanes of 1, 56 and 242 squadrons were unleashed against a large enemy raid north of London after their fighter escort was forced to turn back for France. Thirteen Fighter Command squadrons were in action in total against the raid of approximately 300 aircraft, which attacked targets from Harwich to Oxford in groups of ten to 20 aircraft. Twenty-nine enemy aircraft were shot down, and out of three Hurricane squadrons only 56 Squadron lost two aircraft, with one pilot injured and the other safe. 'A' Flight of 253 Squadron, led by Sqn Ldr T. Gleave, was less fortunate when it broke cloud during a climb only to find itself in the middle of a formation of approximately 90 Bf 109s. Gleave instinctively attacked and within a minute had shot down three Bf 109s and probably a fourth before making his escape. His three wingmen were not so lucky, all being shot down; two were killed and the third injured.

The week beginning Saturday 31 August was by far the most critical week of the Battle of Britain. It would see 55 pilots killed and 78 wounded, and the loss of 107 Hurricanes and 71 Spitfires in combat. This rate of attrition represented an entire squadron of pilots being lost each day and nearly two squadrons per day in aircraft. Squadrons were now being withdrawn from the battle to rest at a moment's notice, to be replaced by fresh squadrons from the north of England and Scotland. Very often the unit being withdrawn only had four or five aircraft serviceable on strength, and such was the extent of their losses that they were temporarily re-designated as training units.

Some of the older Hurricane squadrons were now brought back into the battle, all eager to see action again. Saturday 31 August was by far the worst day for the Hurricane squadrons. 56 and 79 Squadrons each lost four fighters, 1 (RCAF) and 601 Squadrons lost three apiece, and 85, 151, 253, 257 and 310 Squadrons each lost two, while 1, 111, and 501 Squadrons each suffered the loss of a single Hurricane. It had truly been a horrendous day. Amongst these losses were included three squadron commanders. 85 Squadron's Sqn Ldr P. W. Townsend was shot down by a Bf 110 over Tunbridge, but managed

© Osprey Publishing • www.ospreypublishing.com

A pair of 615 (County of Surrey) Squadron Hurricane Mk Is about to touch down at Northolt in October 1940 after another successful defensive patrol. (Via author)

to bail out with a wounded foot. The outgoing 253 Squadron commanding officer was shot down over Cudham by a Ju 88, and his replacement, Sqn Ldr H. M. Starr, was also unlucky. He was shot down and killed by enemy fighters over Grove Ferry while flying Hurricane Mk I L1830.

The weather window in which the German invasion was meant to occur was rapidly closing by mid-September, but this did not stop the commander of the Luftwaffe, Hermann Göring, from giving it his all again on 15 September. However, the Luftwaffe found itself up against a revitalised RAF, and by the end of the day's fighting, 179 enemy aircraft had been destroyed for the price of 30 RAF fighters, 23 of these being Hurricanes, although not all were written off. In terms of manpower, the Luftwaffe lost 163 aircrew either killed or captured, making it clear that the Fighter Command was far from defeated. Hitler was forced to shelve his plans to invade Britain.

From this point, the momentum of the Luftwaffe raids began to falter until 27 September, when three major attacks were despatched from France between 0900hrs and 1530hrs by approximately 640 enemy aircraft. All three raids targeted London, but many of the formations were broken up by determined head-on Hurricane attacks, while the Spitfires fought furiously with the Bf 109 escorts. By the early evening, another 131 enemy aircraft lay strewn across the English countryside at a cost of 30 fighters, 13 of them Hurricanes.

The last great success of the Hurricane during the final stages of the Battle of Britain was against an enemy that was not known to be operating in Northern Europe, namely the Corpo Aereo Italiano. On 11 November, the same day that the Fleet Air Arm carried out its successful Taranto attack, the Hurricanes of 17, 46 and 257 squadrons intercepted a force of ten BR.20s escorted by 40 CR.42s, G.50s and a few Bf 109Es, intent on bombing Harwich. 257 Squadron alone, under the temporary command of Flt Lt H. P. 'Cowboy' Blatchford, claimed nine Italian aircraft and a single Bf 109E. After Blatchford had run out of ammunition, he attacked a CR.42 by ramming it and 'milling the enemy's top wing with his propeller!' With no losses incurred by the defending Hurricanes, the Italians never returned to Britain in daylight, and by the end of 1940 they were withdrawn from their Belgian bases.

© Osprey Publishing • www.ospreypublishing.com

Fighter Command had clearly defeated the Luftwaffe, but the battle of France and Battle of Britain had taken their toll, since over 50 per cent of the highly experienced pre-war pilots had been killed during this period. However, regulars such as Douglas Bader, Bob Stanford Tuck, Roland Beamont and James Harry 'Ginger' Lacey, to name a few, would help carry Fighter Command through its most difficult period, transforming its role from defensive to offensive in a matter of months.

There is still conjecture today as to the exact figures for the Battle of Britain, but Fighter Command claimed 2,741 enemy kills, 42 per cent by Spitfires, 3 per cent to other types and 55 per cent to Hurricanes. Many of these kills were achieved by airmen whose countries had been overrun by the Germans, including Czech pilot Sgt Josef Frantisek, of 303 (Polish) Squadron, who became the highest scorer with 17 German aircraft downed. Sadly, he was lost in his Hurricane Mk I R4175 at Ewell, Surrey on 8 October 1940.

On the Back Foot in North Africa and the Mediterranean

When Italy declared war on Britain in June 1940, only one Hurricane was available to the RAF in the Middle East. This soon changed, however, as several more were making their way south across France, arriving at Sidi Barrani, Egypt to equip a flight of 80 Squadron under the command of Sqn Ldr R. C. Jonas, whose main aircraft was the Gladiator. As more aircraft followed, 274 Squadron was re-formed at Amiriya on 19 August from elements of 33, 80 and 112 squadrons to become the first all-Hurricane unit in the entire Middle East. With the exception of the odd encounter with a few SM.79s, the Hurricane saw very little action until the first major Libyan campaign began in December 1940.

When this campaign began, 33 and 274 squadrons were already operational, and to bolster the fighter strength 73 Squadron joined them following an epic flight across West Africa after taking off from HMS *Furious*. From January 1941, encounters with German aircraft were on the increase with regular encounters with Bf 109Es, which were considerably more challenging than their Italian counterparts.

In February 1941, the British advance across the desert had petered out. At the same time several additional Hurricanes were placed on 80 Squadron's

Hurricanes of 274 Squadron at Amirya in 1940. Nearest the camera is P2544, which survived its tour of duty with 274 Squadron only to be pranged with 71 OTU at Ismailia in Egypt on 6 June 1941. (Via author)

© Osprey Publishing • www.ospreypublishing.com

strength following its departure to Greece, where it had still been struggling on with the Gladiator. The same month, 80 Squadron was bolstered by 33 Squadron, who moved to Eleusis and then Larissa.

March saw Rommel's Afrika Korps push the British back into Egypt. At the same time 274 Squadron was withdrawn from action for a rest, leaving only the Hurricanes of 73 Squadron and 3 (RAAF) Squadron to face the Luftwaffe. 6 Squadron was also in theatre, but the Hurricanes on strength were Tac R variants and not all were armed. The opposition was the Bf 109Es of the highly experienced I/Jagdgeschwader (JG) 27, with the likes of Leutnant H.-J. Marseille and Oberfeldwebel O. Schultz, and the Bf 110Cs of the equally experienced III/Zerstörergeschwader (ZG) 26. Both enemy units would inflict heavy losses upon the less experienced Hurricane pilots.

In Greece, the German forces began their offensive in April 1941 and despite a spirited defence, the Allies were pushed out very quickly. It was in Greek skies that the OC of 33 Squadron, Sqn Ldr M. T. St J. 'Pat' Pattle DFC, became the RAF's unofficial highest scorer of World War II, with at least 50 victories. Twenty-six of these were Italian aircraft; 15 were brought down while flying the Gladiator and the remainder were all with the Hurricane, making him the highest scoring pilot on both types.

After withdrawing to Crete, the remnants of 33, 80, 112 and 805 squadrons continued to fight the Axis until the last aircraft fell.

Hurricanes were not all on the back foot during the early part of World War II. The three SAAF (South African Air Force) squadrons flying the type over East Africa had gained complete superiority over the Italian Air Force. 2 (SAAF) Squadron, flying Gladiators, Hurricanes and even a few Furies, covered southern Ethiopia, bolstered later by more Hurricanes from 3 (SAAF) Squadron. The skies above Eritrea, further north, were covered by the Gladiators of 1 (SAAF) Squadron, which were replaced by Hurricanes from December 1940. By April 1941, Commonwealth troops had overwhelmed the Italian ground forces, and Eritrea and the Ethiopian capital were in Allied hands. The bulk of the Italian forces surrendered in May, although remnants continued to hold out until November; throughout this period there was no aerial opposition with which the SAAF Hurricanes could contend.

Taking the Fight across the Channel

Early 1941 saw the introduction of the Hurricane Mk IIb, with 601 (County of London) and 605 (County of Warwick) Squadrons, followed by the first Mk IIcs with 1 and 3 Squadrons. It was these squadrons that began the first offensive operations over Northern Europe, which, although often costly, showed that the RAF was finally fighting back, rather than merely defending.

1941 was a year of change for the Hurricane, and saw 13 squadrons re-equipped with the type but, by the end of it, 25 squadrons had been re-equipped again, 19 of them with Spitfires. From October 1941, the Hurricane began fighter-bomber operations, proving particularly effective against shipping and coastal targets. Night intruder operations by 1 and 3 Squadrons achieved great success with the cannon-armed Mk IIc and continued to do so well into 1942.

Early 1942 saw even more squadrons giving up their Hurricanes for Spitfires and Typhoons. Many new squadrons were supplied with Hurricanes before they became operational, more often than not replacing them with a modern counterpart later. There was an exception, however, when 184

© Osprey Publishing • www.ospreypublishing.com

Squadron was formed at Colerne on 1 December 1942 with the potent Hurricane Mk IId; there was still life in the old fighter yet.

The last major action to involve the Hurricane from English bases was Operation *Jubilee*, the raid on Dieppe on 19 August 1942. Eight Hurricane units took part in the ill-fated operation, 3, 32, 43, 87, 174, 175, 245 and 253 squadrons. Everyone suffered casualties, totalling 12 pilots killed and 27 aircraft lost.

The formation of the 2nd TAF (Tactical Air Force) in June 1943 marked an unexpected resurgence in demand for the Hurricane fighter-bomber, thanks to the delay and general unavailability of its replacement, the Typhoon. The Hurricane Mk IV was the weapon of choice and 137, 164, 184, 186 and 438 squadrons all filled an important gap in the 2nd TAF's ground attack capability during 1943. 184 Squadron, operating from Manston in Kent, gained the honour of being the first Hurricane unit successfully to carry out a rocket attack against enemy shipping on 29 July. 137 and 164 squadrons also became masters of the art of maritime rocket attacks, but by the beginning of 1944 the Hurricane was finally superseded by the Typhoon.

Over British skies, only 309 Squadron operating from Snailwell in Cambridgeshire and then Drem from April 1944 was flying any mark of Hurricane in an operational capacity. The Mk IV was received in February, followed by the Mk IIc in April, both committed to the air defence of Scotland until October 1944, when they were replaced by the Mustang Mk III.

402 (Winnipeg Bears) Squadron was formed with Hurricane Mk Is at Digby in March 1941. By June the unit was operating the Mk IIb, and after extensive training was one of many squadrons taking the fight back to the enemy across the Channel. BE417 is pictured at Warmwell in November 1941 being loaded with 250lb bombs. (RAF Museum via author)

© Osprey Publishing • www.ospreypublishing.com

Air and ground crew of 81 Squadron relax with Russian soldiers and sailors at Vaenga in September 1941. The fighter behind them is Gloster-built Hurricane Mk II Z5227, which was officially handed over to the Russians on 28 October 1941. (Via author)

Defence of Malta

Malta gained a second Hurricane unit on 12 May 1941 when 185 Squadron was re-formed at Hal Far from the remains of 261 Squadron and 1430 Flight, both of whom had been defending the island since August 1940. Another Hurricane unit, 46 Squadron, which was only meant to be transiting through Malta on 20 May en route to Egypt, was retained on the island. 46 Squadron did continue on to Egypt, but left its pilots behind to form the nucleus of 126 Squadron, which was re-formed at Ta Kali on 28 June 1941. The day after 46 Squadron's arrival, another Hurricane unit, 249 Squadron, landed on Malta via HMS *Furious* and *Ark Royal* to help bolster the precious island's defences.

During late 1941, the second attempt to wipe Malta off the map was instigated by the well-equipped Luftwaffe. Despite the island being reinforced further by the arrival of 242 and 605 squadrons, the Hurricanes began to show their age against the enemy fighters, particularly the Bf 109F.

The first of many Spitfires to arrive in the Mediterranean was despatched to Malta in the spring of 1942. 126 Squadron re-equipped first with the Spitfire in March, followed by 185 and 249 squadrons in May. The Hurricanes of 229 Squadron were also moved to the island on 29 March, but just over a month later the unit was disbanded at Hal Far to be re-formed at Ta Kali four months later with Spitfires. By the summer of 1942, the Hurricane had done its duty for Malta and was not seen there operationally again.

Air Defence in Russia

When Hitler turned his attention away from invading Britain in the west, he began his campaign in the east to invade Russia under Operation *Barbarossa*. Russia was initially overwhelmed by the Germans' Blitzkrieg tactics, losing much of its air force on the ground through persistent Luftwaffe raids.

Britain came to Russia's aid by despatching two Hurricane Mk IIb units, 81 Squadron and 134 Squadron, under the control of 151 Wing, arriving at

© Osprey Publishing • www.ospreypublishing.com

A Russian Hurricane Mk IIb warming its Merlin through before another sortie. The fighter, pictured in 1942, is fitted with a pair of 20mm ShVAK cannons and two 7.7mm UB guns. (Via author)

Vaenga on board HMS *Argus* on 7 September 1941. The main objective of 151 Wing was to train Russian pilots in the art of flying the Hurricane, which would at first be specifically used for the defence of Murmansk. However, there were plenty of opportunities to attack the enemy during this 'training' period and, before the aircraft were handed over to the Russians, RAF pilots shot down 16 German aircraft for the loss of one Hurricane. By November, 151 Wing and its squadrons were sailing back to Britain after handing their aircraft over to the 72nd Regiment of the Soviet Naval Fleet.

The Russians would later use the Hurricane in the ground attack role, the aircraft being particularly effective when armed with RPs against enemy armour. By the war's end, 2,776 Hurricane Mk IIs had been supplied to Russia, no mean contribution from a country the size of Britain.

Growing Strength in North Africa, the Mediterranean and the Middle East

The number of Hurricane units in the Middle East continued to increase from May 1941. First to arrive was 213 Squadron, followed by 238 Squadron in July and 229 Squadron in September, all equipped with the Hurricane Mk I. Initially, they were attached to other Hurricane units as they were all under strength, but their arrival was warmly received nonetheless.

30 Squadron, which originally operated the Blenheim in Greece, was re-equipped with the Hurricane Mk I in June 1941 at Amiriya, while 33 and 80 squadrons were brought back on line following their mauling in Crete. 80 Squadron found itself in action again as part of Operation *Exporter*, the Allied invasion of the Vichy French-controlled Syria and the Lebanon during June and July 1941. 260 Squadron also joined the fray during the later stages of the

© Osprey Publishing • www.ospreypublishing.com

operation, operating detachments from Beirut and El Bassa during August. 127 Squadron, which was re-formed at Habbaniyah in June 1941, also supported the operation, flying both Gladiators and Hurricane Mk Is. Also worthy of mention is 806 Squadron, whose FAA pilots flew ex-RAF Hurricanes during Operation *Exporter* and continued to do so until the end of 1942 as part of the Royal Navy Fighter Squadron in the Western Desert. When the short and very successful operation came to an end, 127 Squadron was disbanded and absorbed into 261 Squadron, which remained in theatre providing air cover for Allied forces in Iran.

After the last of the Italian forces surrendered in East Africa, 1 and 2 (SAAF) squadrons moved to Iranian airfields. On arrival, 2 (SAAF) Squadron converted to the Tomahawk, and 3 (SAAF) Squadron was not too far behind. By the beginning of the next big offensive in North Africa, Operation *Crusader*, the Western Desert Air Force (WDAF) was 12 Hurricane squadrons lighter.

In support of *Crusader*, 80 Squadron flew the first fighter-bomber operations over the desert. However, the Hurricane became increasingly vulnerable to the newly introduced Bf 109F, which made short work of the RAF's pre-war fighter.

Several Hurricane squadrons, including 94, 260 and 450, had converted to Kittyhawks by mid-1942, but by the beginning of the battle of El Alamein in October quite a few remained and even more followed. 127 and 335 (Greek) squadrons joined the fray over the desert for fighter duties, while 40 (SAAF)

G

THE 'FLYING TIN-OPENERS'

6 Squadron had been an army co-operation unit for many years and was first equipped with the Hurricane Mk I from February 1941. After briefly re-equipping the Gloster Gladiator, Westland Lysander and Bristol Blenheim, the squadron settled down from April 1942 with its most formidable aircraft to date, the Hurricane Mk IId.

It was with 6 Squadron that the Mk IId 'tank buster' first went into action over North Africa on 6 June 1942 under the command of Wg Cdr R. C. Porteous DSO. The pair of 40mm Vickers Type 'S' cannons wreaked havoc amongst Rommel's army, and from its first arrival through to the end of August, 6 Squadron flew 100 sorties, destroying 45 tanks and 35 other softer skinned vehicles. Captured Panzer crews described the Mk IId as follows: 'The first appearance of the Hurricane tank-busters came as a terrible surprise. After they became known, they caused panic every time they dived into attack. The trouble was we seemed to have no support from the Luftwaffe or from our flak.'

However, the 'tank buster' did not have it all its own way. When the Germans began to deploy more mobile flak units, the loss rate could be anything up to 75 per cent. To recover, 6 Squadron was briefly withdrawn from the action.

Future 6 Squadron commanding officer Sqn Ldr D. Weston-Burt DSO recalls when the unit took part in the Battle of El Alamein, which began on the night of 23 October 1942: 'The following morning I was sent with six Hurricane Mk IIDs on a target of 15 tanks and two half-tracks. We found them, attacked and did considerable damage. I personally claimed three tanks definitely hit.'

This scene depicts 6 Squadron during one of its many dangerous yet effective attacks on German armour during the North African campaign. The normal technique for an attack was to begin at 5,000ft, dive down until reaching a speed of 254mph, and then, with the throttle wide open, to approach the target at between 20 and 40ft above the ground. At 1,000yds, the first of three pairs of 40mm shells was let loose before the aircraft broke away, usually giving the tank very little time to retaliate. Most crews would simply batten down the hatches and take the beating, while the braver ones would at least try to defend themselves with the tank's forward machine gun. When stationary, the enemy tank crews got into the habit of digging a slit trench next to the vehicle with machine gun pointing vertically. Without aiming, the machine was loosed off into the air in the hope that a couple of rounds would hit the Mk IId in the vital organs as it swooped overhead. Once the RAF pilots got wise to this they began breaking off before they reached their target.

© Osprey Publishing • www.ospreypublishing.com

© Osprey Publishing • www.ospreypublishing.com

Hurricane Mk IIc BN354 of 213 Squadron, most likely at Misrata, Libya in early 1943. A Hurricane squadron since January 1939, the unit remained so until February 1944 when it re-equipped with the Spitfire Mk V at Idku in Egypt. (Via author)

Squadron arrived to carry out tactical reconnaissance. 7 (SAAF) Squadron was moved to the area as well, only to be soaked up by 6 Squadron flying the Mk IId 'tank-buster'.

During the main battle of El Alamein and the subsequent offensive, General Bernard Montgomery had eight Hurricane fighter-bomber squadrons, which doubled for air defence against Stuka attacks on his troops; the Mk IIcs of 73 Squadron, which specialised in night strafing attacks; 208 Squadron and 40 (SAAF) Squadron flying Tac R operations; and finally 94 and 417 (RCAF) squadrons for area defence.

After Montgomery had pushed forward, 213 and 238 squadrons were ordered to fly ahead to a landing ground out into the desert, far behind the German lines. From there the Hurricanes carried out strafing attacks on enemy troops and vehicles, generally making a nuisance of themselves. These were the only Hurricane units to move with the Eighth Army, with the exception of 73 Squadron, which continued its night raids and the reconnaissance activities of 40 (SAAF) Squadron.

Several Hurricane units were transferred from Britain in support of the successful Operation *Torch*, the Allied invasion of Morocco and Algeria, both under control of the Vichy French. The Hurricane Mk IIcs of 43 Squadron were the first to reach the theatre, arriving at Maison Blanche on 8 November 1942. They were later joined by 32, 87, 225, 241 and 253 squadrons, along with several Spitfire squadrons. After the invasion, several Hurricanes were retained for local defence and convoy patrol duties, but it was not long before these roles were taken over by Spitfires.

As the North African campaign rumbled on, only the Hurricane Mk IIds of 6 Squadron remained as part of Montgomery's armoury in the front line at the beginning of Operation *Pugilist* in mid-March 1943. Once Rommel had been evicted from North Africa in May, several more Hurricane squadrons continued to re-equip with Spitfires, and during Operation *Husky*, the invasion of Sicily in July 1943, only 73 Squadron was still operating Hurricanes over the Allied forces, and this was in their now specialised night flying role. 6 Squadron was in the process of converting to the Mk IV, while those Hurricane units that remained in North Africa were allocated patrol duties along the North African coast rather than being committed to battle.

© Osprey Publishing • www.ospreypublishing.com

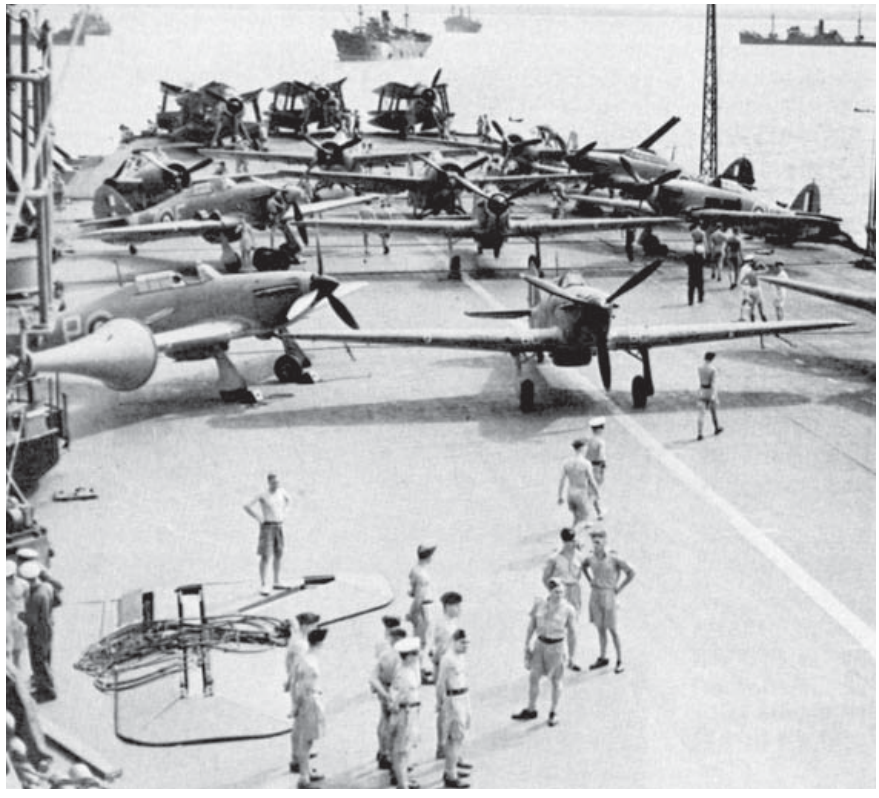
When the fighting finally came to an end in May 1945, only 6 and 351 squadrons were still equipped with the Hurricane. 351 Squadron was transferred to the Yugoslav Air Force on 15 June 1945 while 6 Squadron retained their trusty Mk IVs until January 1947, becoming, by a large margin, the last Hurricane squadron to serve in the RAF.

Singapore, Ceylon and Burma

When the Japanese began their bloody campaign in the Far East in December 1941, not a single Hurricane was based in the theatre. At the time, several pilots from 17, 135, 136 and 232 squadrons were en route to the Middle East but, instead, were diverted to the Far East. They arrived at Seletar, Singapore on 13 January 1942, where all of the pilots flew under the banner of 232 Squadron, flying a few Mk IIbs. A few days later on 28 January the rest of 232 Squadron arrived, along with the Hurricanes of 258 Squadron; both units flying their aircraft off the carrier, HMS *Indomitable*. Both squadrons remained in the theatre until Singapore's fall on 15 February 1942. What remained of both squadrons withdrew to Java where they were joined by parts

This photograph provides the scale for the 40mm cannon mounted under the wing of the Hurricane Mk IId. The 0.303in Browning used for aiming can be seen on the leading edge of the wing above the cannon. (Rolls-Royce via author)

© Osprey Publishing • www.ospreypublishing.com



Hurricanes of 30 and 261 Squadrons on board HMS *Indomitable* in late February 1942. By 8 March, both squadrons had arrived at Ratmalana, Ceylon, destined to remain in the Far East until their disbandment in December 1946 and September 1945 respectively. (Via author)

of 242 and 605 squadrons, which had failed to reach Malta. Within a matter of days, the rate of attrition was so high that only a small part of 242 Squadron remained until it was finally dispersed at Tasikmalaya on 10 March. The Hurricanes had shot down an untold number of enemy aircraft, but the sheer weight of numbers of the Japanese air and ground forces quickly overwhelmed the token force.

17 Squadron, which was also destined for the Middle East before the Japanese assault, arrived in Mingaladon, Burma on 16 January 1942 and was re-equipped with the Mk IIa. The squadron now prepared itself for the Japanese alongside the Buffaloes of 67 Squadron and the Tomahawks of the AVG

A Hurricane Mk IV of 42 Squadron is camouflaged at a forward airstrip, believed to be Onbauk, Burma, in early 1945. The squadron operated the Mk IIc and Mk IV in the ground attack role with devastating effect from October 1943 to June 1945. (Via author)

© Osprey Publishing • www.ospreypublishing.com

(American Volunteer Group). 135 Squadron also arrived at Mingaladon on 28 January and was re-equipped with the Mk IIb. The scene was now set for one of the longest fighting retreats in RAF history.

Both 17 and 135 squadrons performed valiantly against the endless flow of enemy aircraft until the remains of both units were pushed back to India. The squadrons suffered considerably more losses from air attack than air to air combat, and by March 1942 both units were down to a few serviceable Hurricanes. The same month, HMS *Indomitable* delivered two more Hurricane units, 30 and 261 squadrons, both arriving at Ratmalana, Ceylon on 8 March. It was also at Ratmalana that the surviving pilots, who were routed from Java, arrived to re-form 258 Squadron with the Hurricane Mk I and Mk IIb.

All three Hurricane and several FAA Fulmar squadrons successfully defended Ceylon from relentless air attack by Admiral Nagumo's carrier striking force between 5 and 9 April 1942. The battle cost the Royal Navy dearly at sea, and while a considerable number of attacking aircraft were shot down the Hurricane squadrons also suffered terrible losses.

Following the stemming of the Japanese tide over Ceylon, the number of Hurricanes in theatre rapidly rose and by late 1942 there were 13 operational squadrons. Two of these, 17 and 79 squadrons, were put to the test again in the defence of Calcutta in late 1942. Operating from Red Road, the two squadrons were augmented by 67 and 615 squadrons' bases at Alipore and Jessore respectively. Once again, despite heaving bombing, the Japanese were

Hurricane Mk IIc PZ865 captured over the old Vickers factory at Brooklands on 6 November 1985, 50 years after the prototype K5083 first took to the air in the hands of George Bulman. PX865, named 'Last of the Many', was the final aircraft of the approximately 14,600 that were built. (BAE Systems via Owen Cooper)

© Osprey Publishing • www.ospreypublishing.com

kept at bay and having stretched themselves as far west as they could go, the first campaign in the Far East to push the enemy back began in Burma from early 1943. However, despite the addition of 28 Squadron, which re-equipped with Mk IIbs from the Lysander Mk II and made an initial good advance down the Mayun Peninsula, the Allies were pushed back into India again by May.

More Hurricane squadrons were established in the region again during 1943 when 11, 20 and 60 squadrons, who previously flew the Blenheim, were re-equipped with the Mk IIb, IIc and IId, the latter proving to be as useful over the jungle as it was over the North African desert. More Blenheim squadrons followed: 34, 42, 113 and 5 squadrons, which had been flying the Mohawk since December 1941, also re-equipped with the potent Mk IId and the Mk IIc.

The year 1943 saw the Hurricane go from strength to strength in the Far East as the Royal Indian Air Force (IAF) began to re-equip eight of its squadrons with the fighter, of which over 300 were delivered before the end of the war. The IAF Hurricanes flew side by side with their RAF counterparts during the Arakan and Imphal campaigns.

From May 1944, however, the Hurricane was finally coming to the end of its operational life in the Far East. The beginning of the end was marked by 135 Squadron, which had been flying the type since August 1941. The squadron became the first RAF unit to receive the American-built P-47D Thunderbolt. 79, 146 and 261 squadrons re-equipped in June, 30 Squadron in July, 134 and 258 squadrons in September and 5 Squadron in October 1944. Prior to this, 67 Squadron relinquished its Mk IIcs for the Spitfire Mk VIII in February 1944, and 17 Squadron did the same the following month. 20 Squadron served with distinction with the Mk IId during the second Arakan campaign, and later, along with 60 Squadron, also received the Mk IV. Re-equipping with the Thunderbolt and Spitfire continued through early 1945, and by the war's end only 20 Squadron and the IAF squadrons still flew the Hurricane operationally.

CONCLUSION

It is only in recent years that the Hurricane's contribution to the final outcome of World War II has been fully appreciated. The Spitfire was always on a pedestal from the beginning, strongly emphasised when the Battle of Britain flypast in September 1945 was carried out. The flypast was led by Gp Capt Douglas Bader DSO DFC, a survivor of the Battle of Britain and ex-Hurricane pilot, but on this day he was flying a Spitfire. There was not a single example of the Hawker-built fighter on display a mere five years after the end of one of the world's most crucial aerial battles. Post-war Britain was not a place for sentimentality, and even Sydney Camm was in no mood to dwell on the past as he forged ahead with jet designs for the future, high-tech RAF.

However, those who had flown the Hurricane, whether in the skies over south-east England, the North African deserts or the jungles in the Far East, retained fond memories of the aircraft. Bader himself was pleasantly surprised when he first flew the Hurricane in June 1940, describing what seemed like a big aircraft on the ground as being, when airborne, highly manoeuvrable, harmonised, viceless, strong, and a superb gun platform, remaining 'rock-steady' when all eight guns were fired. Its ability to out-turn a Spitfire and more significantly a Bf 109 cancelled out the fact that it was 30mph slower than the enemy fighter. This difference in performance was reduced with later

© Osprey Publishing • www.ospreypublishing.com

marks, but by this time the Hurricane was retired from the pure fighter role to become a dedicated ground aircraft, a role in which it would see more action than any other.

In a nutshell, the Hurricane operated and fought in considerably more campaigns, fronts, theatres and countries than any other aircraft during the entirety of World War I. Only the Blenheim came close to matching it, while the 'big' names of the conflict fell far behind. On top of that, the Hurricane shot down more enemy aircraft than any other RAF aircraft during the whole war.

In 2012, there are just 12 airworthy Hurricanes flying in Britain, Canada, New Zealand and the United States out of the more than 14,500 aircraft built. This number will definitely rise over the coming years, as at least half a dozen more are restored to flying condition across the globe.

The story of the Hurricane is much bigger than the aircraft itself. Its development and requirement was one that set the tone for the entire British aviation industry for many years after the fighter disappeared from the skies. However, its disappearance is no reason why this iconic aircraft should ever be overshadowed by another: 'The Royal Air Force was glad to get the Spitfire – it HAD to have the Hurricane!'

FURTHER READING

Blackah, Paul and Louise, and Lowe, Malcolm V., *Hawker Hurricane*, Haynes (2010)

Bowyer, Chaz, *Hurricane at War*, PBS (1974)

Gallico, Paul, *The Hurricane Story*, MJ Ltd (1959)

Jefford, Wg Cdr C. G., *RAF Squadrons*, Airlife (1988)

Mason, Francis K., *The Hawker Hurricane*, Aston (1987)

Thetford, Owen, *Aircraft of the RAF since 1918*, Putnam (1995)

© Osprey Publishing • www.ospreypublishing.com

INDEX

References to illustrations are shown in **bold**

Aeroplane and Armament Experimental Establishment 11–12, 13
Air Ministry 4, 6–8, 11, 12–13, 30, 35
aircraft carriers 20–21, 39–40, 59, **60**
armour 17, 18, 19, 28

Battle of Britain (1940) 45–46, 48–51
Bf 109s 19, 44, 46, 48–49, 50, 51, 52, 54, 56
Bf 110s 19, 44, 46, 48, 52
British Expeditionary Force 37–38, 41–42, 44
Brooklands 5, 10, 12, 13, **61**
Bulman, George 4, **5**, 6, **9–10**, 10–11, **12**, 13
Burma 60–61, 62

Camm, Sydney 6, 7–8, 9, 11, 13, 62
Canada 20, 30, 32
canopy **7**, 11, 34
catapults 20–21
Ceylon 61
climb rates 6, 12, 18, 22, 27
Clowes, Sgt A.V. **15** (14), 38
Continuation War (194–44) 39
contracts 9, 13

Dagger Hurricane 34
Defiants 46, 48
Dieppe, raid on 26, 53
dimensions, Hurricanes 18, 22, 27, 28, 29
Dorniers 38, **43** (42), 46, 48, 49
Dowding, ACM Hugh 37, 40, 41
Dunkirk 41–42, 44

El Alamein, Battle of (1942) 56, **57** (56), 58

F.36/34 Single-Seat Fighter 7–8
F.37/35 Four-Cannon design 33
Far East 59–62
Fighter Catapult Ships 20–21
Finland 39
Fleet Air Arm 20–21, 26, 50, 56, 61
France, Battle of (1940) 40–42, 44
Fury **6**, 6–7
fuselages **16**, 16–17
FW 200; 21

Gillan, Sqn Ldr J.W. **15** (14), **33**, 34–35
Gladiators 36, 37, 39, 45, 52
Glorious, HMS 39–40
Greece 52
Griffon Hurricane 34
ground attack role 26, 28, 29, 55

Hart planes 6, 7, 10
Hawker F.20/27; 6
Hercules Hurricane 34
H.G.Hawker Engineering 5–10, 12–13
Hillson FH.40 Slip-Wing Hurricane (Mk I) 20, **32**
Hurricane (Improved Canopy) Project 34
Hurricane Mk I **14**, **15** (14), 18–22, **19**, **35–36**
  in action 37–38, **43** (42), **45–46**, 46, **47** (46), 48–50, **50–51**, 55–56, 61
Hurricane Mk I (Canadian) 30
Hurricane Mk I `Floatplane' 20
Hurricane Mk I `Tropical variant' 19
Hurricane Mk Ib **23** (22)
Hurricane Mk II 22, **23** (22), 24, 27, **54**
Hurricane Mk IIa **21**, 24–25, 60
Hurricane Mk IIb **23** (22), 25
  in action 52, **53**, 54–55, **55**, 59, 61, 62
Hurricane Mk IIc **23** (22), **25**, 25–26, 33
  in action 52, 53, 58, **58**, **61**, 62
Hurricane Mk IId **26**, 26–27, 53, **57** (56), 58, 62
Hurricane Mk IIe 27
Hurricane Mk III 27–28
Hurricane Mk IV 28, **28**, 53, 58, 59, **60**, 62
Hurricane Mk V 29, **29**
Hurricane Mk X (Canada) 30, 32
Hurricane Mk XI (Canada) 32
Hurricane Mk XIb (Canada) 32
Hurricane Mk XII (Canada) **30**, 32
Hurricane (side-blister) Canopy 34

Indian Air Force 62
Indomitable, HMS **60**
Interceptor Monoplane to F5/34; 8
Intermediate Fury 7
Italy 45, 50, 51, 52, 58

Japan 59–62
Ju 87s 41, 44, 45, 48
Ju 88s 39, 44, 48, 50

K5083; **7–10**, 9–12, **12**, 13–14, **15** (14), 16, 18
Kain, Fg Off E. `Cobber' 38, **43** (42)
Kestrel engines 6, 7

Laminar Flow MkIIb 25
Lee, Fg Off R.H.A. **47** (46)
Lewis, Fg Off A.G. **47** (46)
Lucas, Philip 13, **29**
Luftwaffe 37–38, 39–41, **43** (42), 44–46, 48–52, 54

Malta 44–45, 54
Mediterranean 45, 51–52, 54, 55
Merlin 24 engines 28
Merlin 27 engines 28
Merlin 32 engines 29
Merlin C engines 10, 11–12, 13, 14, 18
Merlin II engines 13, 18, 22
Merlin III engines 19, 21, 22, 30
Merlin XX engines 24, 26, 27
Middle East 51–52, 55–56

Nicolson, Flt Lt E.J.B. 48–49
night fighters 5, 26, 52, 58
North Africa 51–52, 56, **57** (56), 58
Norway 39–40

Operation *Barbarossa* 54–55
Operation *Crusader* 56
Operation *Dynamo* 41–42, 44
Operation *Exporter* 55–56
Operation *Husky* 58
Operation *Jubilee* 53
Operation *Torch* 58

Packard-Merlin engines 27, 30, 32
Phoney War 37–38
photographic reconnaissance 29
pilot protection 17, 19, 28
PR Mks I&II; 29
propellers 18, 19, 29, 30, 32
PV.3; 7
PV.12 engines 8, 9–10, 18

radios 19
RAF/RAAF No.1 Sqn **15** (14), 26, 36, 37–38, 40, 44, 49, 52; No.3 Sqn 26, 35, 40, 41, 52, 53; No.6 Sqn 27, 28, **57** (56), 58, 59; No.17 Sqn 44, 50, 60–61, 62; No.20 Sqn 62; No.28 Sqn 62; No.30 Sqn 55, **60**, 61, 62; No.32 Sqn 36, **45**, 46, 53, 58; No.33 Sqn 51, 52, 55; No.43 Sqn 36, 46, 53; No.46 Sqn 36, 39–40, 50, 54; No.56 Sqn 25, 35–36, 46, 49; No.73 Sqn 36, **36**, 37, 38, 40, **43** (42), 44, 51, 52, 58; No.79 Sqn 36, 37, 40, 46, 49, 61, 62; No.80 Sqn 51–52, 55, 56; No.81 Sqn **54**, 54–55; No.85 Sqn 36, 37, 38, 40, 41, 49–50; No.87 Sqn **23** (22), 36, 37, 38, 40, **40**, 41, 53, 58; No.111 Sqn **4**, **15** (14), **33**, 34–35, 38, 44, 46, 48, 49; No.135 Sqn 61, 62; No.137 Sqn 53; No.145 Sqn 46; No.151 Sqn 36, 48, 49; No.151 Wing 54–55; No.164 Sqn 53; No.184 Sqn 52–53; No.213 Sqn 36, 42, 55, 58, **58**; No.232 Sqn 59–60; No.238 Sqn 55, 58; No.242 Sqn 44, 49, 54, 60; No.249 Sqn 48–49, 54; No.253 Sqn 49, 50, 53, 58; No.257 Sqn 49, 50; No.258 Sqn 59–60, 61, 62; No.260 Sqn 55–56; No.261 Sqn 44–45, 56, **60**, 61, 62; No.264 Sqn 44, 46, 48; No.274 Sqn 51, **51**, 52; No.402 Sqn **23** (22), **53**; No.501 Sqn 37, 41, 44, **46**, 49; No.601 Sqn 42, 46, 49, 52; No.603 Sqn 49; No.605 Sqn 52, 54, 60; No.607 Sqn 37, 40; No.615 Sqn **15** (14), 37, 40, 41, **50**; No.806 Sqn 56; No.880 Sqn **23** (22); AASF 37, 44; Air Component of BEF 37, 41
reconnaissance 28, 29, 58
Royal Navy 20–21, 22, 56
rudders 13, 18–19
Russia 32–33, 39, **54**, 54–55

Sea Hurricanes **20**, 20–21, 22, 26, 32
Singapore 59
ski landing gear 32
Smallwood, Sqn Ldr D.G. **23** (22)
Sopwith, Sir Thomas 5, **5**
South African Air Force 52, 56, 58
speed
  Fury 6
  K5083 11, 12, 18
  Mk I; 22, 35
  Mk II; 24, 27
  Mk IV; 28
  Mk V; 29
  PV.3; 7
  Sea Hurricane Mk Ic 22
Spitfires 11–12, 36, 46, 48, 49, 50, 52, 54, 58, 62
supercharger 18, 24

Tac R Mk I & II; 29, 52
Tactical Air Force 53
tactical reconnaissance 29
tanks, German **57** (56)
test flights 8, 9, 10–12, 13, 14
Test Pilot (film) 14, 16
Thunderbolts 62
Two-Cannon Hurricane 33
two-seaters 32–33
Typhoons 52, 53

undercarriage 17

weapons
  bombs **24**, 26, 27, 28, 29, **31** (30), **53**
  Browning 8, 9–10, 18, 22, **24**, 25, 27, 28, 29, **31** (30), **59**
  Hispano cannon 26, 27, 29, **31** (30)
  Oerlikon cannon 21, 22, 25, 33
  Rocket Projectiles 25, 28, 29, **31** (30)
  Rolls-Royce BF gun **31** (30)
  ShVAK cannon **55**
  UB guns **55**
  Vickers guns 8, 9
  Vickers Type `S' cannon **26**, 27, 28, 29, **31** (30), **57** (56)
weights, Hurricanes 18, 22, 27, 28, 29
Weston-Burt, Sqn Ldr D. **57** (56)
wings 17, 20, 25, 26, 28, 30, **32**
Winter War (1939–40) 39
Woodcock planes 5

Yugoslavian Hurricane 33

© Osprey Publishing • www.ospreypublishing.com